

**INTRAVENOUS DRUGS PREPARATION AND
ADMINISTRATION
IN
EMERGENCY AND TRAUMA DEPARTMENT**

**By
EMERGENCY AND TRAUMA DEPARTMENT
HOSPITAL SULTANAH AMINAH JOHOR BAHRU**

IV DRUGS PREPARATION AND ADMINISTRATION

COMMITTEE

Emergency Physicians

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Dr Mohd Amin Mohidin (Chairperson and Editor)

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Dr Jonathan Lee Chee Siong

Dr Gan Kiat Kee

Emergency Pharmacists

Puan Haliza Ab Jalal (Editor)

Puan Guee Xin Nee (Editor)

Cik Noor 'Atikah Binti Jasman

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INFUSION FORMULA

3mg in 50 ml —————> 1ml/hour = 1mcg/min
3mg/kg in 50 ml —————> 1ml/hour = 1mcg/kg/min
1/2 mg/kg in 50ml —————> 1ml/hour = 10mcg/kg/hour

Percentage Concentration

X% of drug equivalence with X GRAM of drug in 100ml diluent

**ALL DRUGS ARE TO BE DILUTED WITH NORMAL SALINE
EXCEPT
NORADRENALINE AND AMIODARONE (WITH D5%)**

IV DRUGS PREPARATION AND ADMINISTRATION

DERIVATION INFUSION FORMULA

1. **Rules of 6** (*from Paediatric Advanced Life Support (PALS) for Doctor 2005*)

6 x Body weight (Kg) = drug in miligram and add total volume 100ml
simplified in 50ml syringe ie x 1/2:

3 x Body weight (Kg) = drug in miligram and add total volume 50ml

So, if we run

1 ml/h equivalence with 1.0mcg/kg/min.

Example of usage for Inotropes/vasopressor

Dopamine for 65kg pt

$3 \times 65 = 195\text{mg}$ almost 200mg in 1 ampule of dopamine (single strength)

Dilute in 50 ml and run 5-25ml/H = 5-25 mcg/kg/min

2. **Rules of 3** (*from Manual of Drugs in Anaesthesia and Intensive Care, Department of Anaesthesia and Intensive Care Hospital Kuala Lumpur 1998*)

3 mg of any drug and add to total volume of 50 ml

So X ml/h equivalence to X mcg/min

*Not according to body weight

Example

a. Salbutamol infusion for asthma with dosage range 5-20mcg/min

b. Adrenalin infusion for anaphylaxis in adult (*Tintinalli 8th edition*)- start with 1 mcg/min and titrate dose as needed

IV DRUGS PREPARATION AND ADMINISTRATION

3. **Rules of 1/2 body weight** (*from ICU book Tan Tock Seng Hospital, Singapore*)

1/2 BW in 50 mls

1 ml/h equivalence 10mcg/kg/h

Example of atropine infusion for organophosphate poisoning;

in 50kg patient, take **25 ampule (mg) of atropine and dilute in 50 ml NS** syringe. The dose from 20 to 80 mcg/kg/h equivalence to **2 to 8 ml/H** and titrate according to the effect. Disadvantage of this formula required a lot number of ampules.

Alternatively may use formula from Sarawak protocol:

8mg of Atropine in 100cc Ns or **4mg in 50 cc Ns syringe**

and run similar 20-80mcg/kg/h (0.02-0.08 mg/kg/h)

For 50kg patient the infusion rate will be **12.5ml/h to 50ml/h** ie (0.25-1.0 ml/kg/h)

ACTRAPID INSULIN INFUSION

Preparation: 100 IU/ ml

Use 50 mls syringe

Take 50 IU of insulin (0.5 mls)

Dilute with 49.5 ml of Normal Saline = 50 mls dilution

Rate: 1ml/ hour = 1 IU/ hour

Ref: Clinical Practice Guidelines on Management of Type 2 DM, KKM 2015

Hospital Sultanah Aminah Guidelines for Drug Reconstitution, 2013

Commence Fixed Rate IV Insulin Infusion

- **0.05 to 0.1 U/kg/hr** based on estimate weight
- **Aim to drop Blood Glucose Level (BGL)/ Glucometer (GM) 2-5 mmol/L per HOUR**
- INCREASE if BGL doesn't drop by a minimum of 2 mmol/hr
- INCREASE if serum ketone doesn't decrease by minimum of 0.5mmol/hr (if available)
- REDUCE dose if BGL dropping too rapidly > 5 mmol/hr

ADRENALINE INFUSION

Preparation: 1 ampoule 1ml (1:1000 = 1mg / ml)

Dilute 3.0 mg (3mls) of Adrenaline with 47 mls of Normal Saline in 50 mls syringe.

Rate: 1ml/hr = 1mcg/min (*Document rate on Syringe Pump & in Patient's Notes*)

Dose: 1 – 10 mcg/min (starting infusion rate 0.1 mcg/kg/min)

Titrate accordingly to desired BP - (*Infusion range 0.1-2.0mcg/kg/min ie for 50kg patient start with 5ml/h*)

Calculations:

- Dilute 3mg adrenaline in 50mls NS (Preferable to use single strength in ED)
- 50mls \rightarrow 3mg \rightarrow 3000mcg
- 1ml \rightarrow $3000/50 = 60$ mcg
- 1ml/hr \rightarrow 60mcg/hr \rightarrow 60mcg/60min \rightarrow 1 mcg/min
- 1ml/hr = 1 mcg/min

Use single strength in ED, especially if infusion is through a peripheral line.

Make sure BP cuff is not on the Arm of the peripheral line.

Regularly inspect the site of insertion of the peripheral line.

Ref: Hospital Sultanah Aminah Guidelines For Drug Reconstitution 2013

IV DRUGS PREPARATION AND ADMINISTRATION

ADRENALINE INFUSION TABLE

3mg in 50ml Normal Saline

Strength: 0.06mg/ml

PREPARATION: Add 3 ampoules of 1mg/ml Adrenaline to 47ml of 0.9% Sodium Chloride. Use a 50ml syringe.

| DOSE MCG/KG/MIN | BODY WEIGHT (KG) | | | | | | | | | | | |
|--------------------|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| | Rate (ML/HR) | | | | | | | | | | | |
| 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 | 45.0 | 50 |

Anaphylaxis

a) IV Adrenaline 1:10 000

-Dilute 1mg (1ml) to 10 cc N/S

-Dose: Give titrating bolus 1 ml up to 0.1ml/kg

b) or if IV line not available,

give deep IM Adrenaline 1:1000

-Dose: 0.01mg/kg (i.e: Body wt 50kg= 0.5mg = 0.5ml) Max 0.5mg

c) IV Infusion if patient not response with boluses.

IV DRUGS PREPARATION AND ADMINISTRATION

PUSH DOSE PRESSOR (PDP)

| ED only adult push dose pressor IV administration Guidelines | |
|---|--|
| Indication | Extremis patient with severe hypotensive (only ordered by EP) |
| Form Provided | Adrenaline 1mg/ml in 1 ml ampoule (1:1000) |
| Preparation | Take 1 ml of adrenaline 1mg/ml and dilute into 10ml syringe of normal saline = 0.1 mg/ml (100 mcg/ml) Take 1 ml from the 0.1mg/ml and dilute further to another 10ml syringe of normal saline = 0.01mg/ml (10mcg/ml) |
| Starting dose | Titration/ Incremental dose |
| 5-20mcg (0.5-2.0 ml) slow IV push | Repeat dose per direction of Emergency Physician (EP) every 1-5 minutes as needed. Increase dose per direction of EP to 10-20mcg based on response |
| Important Information | <ul style="list-style-type: none"> • Syringe provides dose to be given incrementally (eg 0.5-1ml (5-10mcg) with additional doses, or dose increase based on response every 1-5 minutes • MUST BE GIVEN BY EP OR MAY BE GIVEN BY STAFF NURSE PER DIRECTION OF EP PRESENT AT BEDSIDE • Extravasation risk- use CVL or large vein when available • Use as temporising measure for hypotension • Adrenaline has both alpha and beta- adrenergic activity- may cause tachycardia in addition vasoconstriction. Consider phenylephrine in significant tachycardia or any tachyarrhythmias. |
| Minimum monitoring | <ul style="list-style-type: none"> • ED use only • Monitor HR and BP at least every 5 minutes while administering/ titrating, and if appropriate, q5min x 3 after administration. |
| | <i>(Holden et al, Safety Consideration and Guideline-Based Safe Use Recommendation for “Bolus Dose” Vasopressor in Emergency Department, Annals of Emergency Medicine 2017.)</i> |

ADRENALINE INFUSION (Paediatrics)

In paediatrics patient: *Refer Frank Shann* - Calculation of the composition of drug infusion (50mls Syringe pump)

Dilution: 0.15mg/kg in 50mls D5%

Dose : 0.05 -0.5 mcg/kg/min (1-10ml/hr)

Rate : 1-10ml/hr

• *Document dilution on Syringe Pump & in Patient's Notes*

E.g. 10 kg patient

$10 \times 0.15\text{mg} = 1.5\text{mg}$ (Add 1.5mg adrenaline in D5% to make 50mls)

1 ml/hr = 0.05 mcg/kg/min

0.05 -0.5 mcg/kg/min (1-10 ml/hr)

*In smaller patients, dose can be concentrated to 0.3 mg/kg in 50ml D5%

Run at 0.5-5 ml/hr (0.05-0.5 mcg/kg/min)

ALTEPLASE INFUSION (FOR STROKE ALERT)

Preparation: 50 mg in 50 ml

Dilute 50 mg vial of powder Alteplase with 50ml of provided water for injection

Total Dose: 0.9 mg/kg (Max 90mg),

- Syringe out 10% of total dose given as bolus, then
- Draw out remaining 90% dose into 50 ml syringe and give as infusion over 60 minutes

e.g: Body weight: 55 kg, Total dose is $0.9\text{mg} \times 55 \text{ kg} = 49.5 \text{ mg}$

- 10% of total dose = 4.95 mg (5 ml) given as bolus
- Then remaining 90% of dose = 44.5 mg (45ml) syringe out to 50 ml syringe and infuse over 60 mins



AMIODARONE INFUSION

Preparation: 150mg / 3mls

Loading Dose:

5mg/kg bodyweight infused over 20-120 mins
Dilute 2 ampoules of amiodarone (300mg / 6mls)
In 100 mls of Dextrose 5% (*Incompatible with Normal Saline*)
Use microchamber or infusion pump
(*Dilute 150 mg in 50 ml D5%, Run @100ml/Hour (Do in 2 syringes)*)
Run 300mg over 1 hour

Maintenance Dose:

Dilute 6 ampoules of Amiodarone (900 mg/18mls)
In 500mls of Dextrose 5%
Run over remaining 23 hours —> 22mls/hour
Max maintenance dose 1.2gm in 24 hours

Alternative dose:

Preparation from ICU Sungai Buloh
600mg in 50ml D5% (12mg/ml)
Run at **12.5ml/h (150mg)** for **2 hours** then
3ml/h (36mg/ml)

AMINOPHYLINE INFUSION

Preparation: 250mg / 10 mls

Loading dose:

5mg/kg in 100mls NS over 1/2 Hour

Eg: 250-500 mg in 100mls Normal Saline (or 5mg/kg)

Run over 20 - 30 minutes

(Do not give bolus to patients already on oral theophylline/NEULIN)

Maintenance Dose:

Dose:

Non-smoker: 0.5mg/kg/hr

(i.e: BW= 50kg; run @ 5ml/Hr)

Smoker: 0.8mg/kg/hr

Elderly: 0.3mg/kg/hr

Dilute 250 mg in 50 mls syringe with Normal saline

$1 \text{ ml} = 250 / 50 = 5\text{mg}$

1 ml /hr = 5mg /hr

Eg : Body weight 70 kg for young non smoker.

$0.5 \text{ mg/kg/hour} = 0.5 \times 70 = 35\text{mg /hour}$

$35\text{mg/hour} = 35/5 = 7\text{mls /hour}$ (Usual dose at 6-7mls/hr)

Ref: Hospital Sultanah Aminah Guidelines For Drug Reconstitution 2013

ATROPINE INFUSION

Organophosphate poisoning

a) IV Bolus

IV Bolus 0.6 - 3 mg every 5 mins and **doubling** the last dosage for the next dose till atropinisation achieved (SBP > 80 mmHg, HR > 80 bpm, **clear lung**, dry axillae)

b) IV Infusion

10-20% of total dose required to achieve atropinisation infused hourly in 0.9% saline chloride for at least 48 hours then tapering down over days.

If cholinergic toxicity recurs at any point, restart the bolus doses until the patient is atropinized again and increase the infusion rate by 20% per hour

If the patient becomes atropine toxic (tachycardia, absent bowel sounds, hyperthermia, delirium, urinary retention), stop the infusion for 30 min and then start again at a 20% lower dose

Signs of atropinisation (**DR Mercedes Benz Hitam**)
Dry as bone
Red as beet
Mad as Hatter
Blind as Bat
Hot as Hare

(Ref: Eddleston M, Chowdhury F R, Pharmacological Treatment of organophosphate Insecticide Poisoning: The Old and The (possible) new. British Journal of Clinical Pharmacology. 2015, Sept; 81: 462–470.)

Sarawak handbook (prefer)

4mg Atropine (4 amp) + 50ml N/S

Dose: 0.02-0.08mg/kg/hr (0.25-1ml/kg/hr)

For 50kg patient run 12.5-50ml/H

Alternative from **ICU Protocol Tan Tock Seng Hospital Singapore:**

½ Body weight dilute to 50ml N/S

Dose: 20-80mcg/kg/hr (2ml/H- 8ml/H)

CALCIUM GLUCONATE 10%

Hypocalcemia:

Inject **10-30ml** of a **10% Calcium gluconate** solution IV over **10 minutes** (slow bolus)

COCKTAIL REGIME (for hyperkalaemia)

- 1) I/V slow bolus 10mls of 10% Calcium Gluconate
 - The **FIRST** medication to be given immediately
 - Given over 2-5 minutes
 - Cardiac (ECG) monitoring
 - Effect should be evident within a few minutes and last 30-60 minutes
 - Can be repeated once or twice if necessary – titrate against ECG changes
 - Avoid use in hyperkaleamia secondary to digoxin toxicity
- 2) I/V bolus 50mls of Dextrose 50% (Glucose not required if **HYPERGLYCEMIC/DKA**)
- 3) I/V bolus insulin 10 IU
- 4) IV Sodium Bicarbonate (IV NaHCO₃) – **Consult with Emergency Physician**. Given only if patient in SEVERE METABOLIC ACIDOSIS.
- 5) Oral Kalimate – orally every 6 hours. Effect takes 1-2 hours
- 6) Consider Renal replacement therapy (dialysis)

Ref: Lawrence S, Weisberg. Management of Severe Hyperkalemia. Critical Care Med 2008

DIGOXIN

Preparation: 0.5mg in 10ml N/S
Give slow bolus over 10-20 mins

Atrial fibrillation

Loading dose for the management of atrial fibrillation was 0.25 mg IV every 2 hours up to 1.5 mg.
The recommended **daily maintenance dose** was 0.125 to 0.375 mg IV or orally
(ACC/AHA/ESCO)

AF/Heart failure for rapid digitalization

Rapid digitalization may be achieved with a loading dose of 8 to 12 mcg/kg IV. Administer half of the total recommended loading dose as a first dose, then give one-fourth of the total dose every 6 to 8 hours for 2 doses
Example- for pt 50 kg and take 10mcg/kg will be 500mcg ie 0.5mg. Given half as first dose ie 0.25mg then one-fourth ie 0.125mg every 6 hours.

**Special precaution in hypokalaemia patient as will lead to digitalis toxicity.*

Ref: Hospital Sultanah Aminah Drug Reconstitution Guidelines 2013

DOBUTAMINE

Preparation: 1 vial contains 250mg in 20mls

Syringe Pump. No bolus doses. **Preferable to use single strength in ED**

1) Method 1

(Dilution dose is Fixed, but rate is adjusted according to weight)

- 250mg Dobutamine in 50ml NS
- 50mls \rightarrow 250mg
- 1ml \rightarrow 5mg \rightarrow 5000mcg
- 1ml/hr \rightarrow 5000mcg/hr \rightarrow 5000mcg/60min \rightarrow 83.3 mcg/min
- 1ml/hr \rightarrow 83.3 mcg/min

In a 70kg person 1ml/hr \rightarrow 83.3 mcg/min \rightarrow 83.3 mcg/70kg/min

1ml/hr = 1.2 mcg/kg/min (Document Rate on Syringe Pump & in Patient's Notes)

2) Method 2

(Dilution dose is adjusted according to patient's weight. The rate is fixed)

Eg 70kg patient

$$3 \times \text{BW} = 3 \times 70 = 210\text{mg}$$

- 210 mg in 50mls NS
- 50mls \rightarrow 210mg
- 1ml \rightarrow 210/50 = 4.2mg
- 1 ml/hr \rightarrow 4.2mg/hr \rightarrow 4.2mg/60min \rightarrow 4200mcg/60min \rightarrow 70mcg/min
 \rightarrow 1mcg/kg/min

Rate: 1ml/hr = 1mcg/kg/min (Document Rate on Syringe Pump & in Patient's Notes)

IV DRUGS PREPARATION AND ADMINISTRATION

DOBUTAMINE INFUSION TABLE
250mg in 50ml Normal Saline
Strength: 5mg/ml

PREPARATION: Draw out 20ml (1 vial) of 12.5mg/ml Dobutamine. Dilute the 20ml of Dobutamine with a further 30ml of 0.9% Sodium Chloride. Use a 50ml syringe.

| DOSE MCG/KG/MIN | BODY WEIGHT (KG) | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|
| | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| | 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 | 7.1 | 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 |

DOPAMINE

Preparation: 1 vial contains 200mg in 5mls

Use Syringe Pump - No bolus doses. **Preferable to use single strength in ED**

1) Method 1

(Dilution dose is Fixed, but Rate is adjusted according to Weight)

- 200mg Dopamine in 50ml NS
- 50mls \rightarrow 200mg
- 1ml \rightarrow 4mg \rightarrow 4000mcg
- 1ml/hr \rightarrow 4000mcg/hr \rightarrow 4000mcg/60min \rightarrow 66.6mcg/min
- 1ml/hr \rightarrow 66.6mcg/min

In a 70kg person 1ml/hr \rightarrow 66.6mcg/min \rightarrow 66.6mcg/70kg/min \rightarrow 1mcg/kg/min

(Document Rate on Syringe Pump & in Patient's Notes)

2) Method 2

(Dilution dose is adjusted to patient's weight. The Infusion rate is fixed)

E.g. Patients weight 70kg

3 x BW = 3 x 70 = 210mg

- 210 mg in 50mls NS
- 50mls \rightarrow 210mg
- 1ml \rightarrow 210/50 = 4.2mg
- 1 ml/hr \rightarrow 4.2mg/hr \rightarrow 4.2mg/60min \rightarrow 4200mcg/60min \rightarrow 70mcg/min
 \rightarrow 1mcg/kg/min

Rate: 1ml/hr = 1mcg/kg/min *(Document rate on Syringe Pump & in Patient's Notes)*

IV DRUGS PREPARATION AND ADMINISTRATION

**DOPAMINE INFUSION TABLE (Single Strength)
200mg in 50ml Normal Saline
Strength: 4mg/ml**

PREPARATION: Add 1 ampoule of 200mg/5ml Dopamine to 45ml of 0.9% Sodium Chloride. Draw up the solution with a 50ml syringe.

| DOSE MCG/KG/MIN | BODY WEIGHT (KG) | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|
| | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| | Rate (ML/HR) | | | | | | | | | | | |
| 5 | 3.4 | 3.8 | 4.1 | 4.5 | 4.9 | 5.3 | 5.6 | 6.0 | 6.4 | 6.8 | 7.1 | 7.5 |
| 6 | 4.1 | 4.5 | 5.0 | 5.4 | 5.9 | 6.3 | 6.8 | 7.2 | 7.7 | 8.1 | 8.6 | 9.0 |
| 7 | 4.7 | 5.3 | 5.8 | 6.3 | 6.8 | 7.4 | 7.9 | 8.4 | 8.9 | 9.5 | 10.0 | 10.5 |
| 8 | 5.4 | 6.0 | 6.6 | 7.2 | 7.8 | 8.4 | 9.0 | 9.6 | 10.2 | 10.8 | 11.4 | 12.0 |
| 9 | 6.1 | 6.8 | 7.4 | 8.1 | 8.8 | 9.5 | 10.1 | 10.8 | 11.5 | 12.2 | 12.8 | 13.5 |
| 10 | 6.8 | 7.5 | 8.3 | 9.0 | 9.8 | 10.5 | 11.3 | 12.0 | 12.8 | 13.5 | 14.3 | 15.0 |
| 11 | 7.4 | 8.3 | 9.0 | 9.9 | 10.7 | 11.6 | 12.4 | 13.2 | 14.0 | 14.9 | 15.7 | 16.5 |
| 12 | 8.1 | 9.0 | 9.9 | 10.8 | 11.7 | 12.6 | 13.5 | 14.4 | 15.3 | 16.2 | 17.1 | 18.0 |
| 13 | 8.8 | 9.8 | 10.7 | 11.7 | 12.7 | 13.7 | 14.6 | 15.6 | 16.6 | 17.6 | 18.5 | 19.5 |
| 14 | 9.5 | 10.5 | 11.6 | 12.6 | 13.7 | 14.7 | 15.8 | 16.8 | 17.9 | 18.9 | 20.0 | 21.0 |
| 15 | 10.1 | 11.3 | 12.4 | 13.5 | 14.6 | 15.8 | 16.9 | 18.0 | 19.1 | 20.3 | 21.4 | 22.5 |
| 16 | 10.8 | 12.0 | 13.2 | 14.4 | 15.6 | 16.8 | 18.0 | 19.2 | 20.4 | 21.6 | 22.8 | 24.0 |
| 17 | 11.5 | 12.8 | 14.0 | 15.3 | 16.6 | 17.9 | 19.1 | 20.4 | 21.7 | 23.0 | 24.2 | 25.5 |
| 18 | 12.2 | 13.5 | 14.8 | 16.2 | 17.6 | 18.9 | 20.3 | 21.6 | 23.0 | 24.3 | 25.7 | 27.0 |
| 19 | 12.8 | 14.3 | 15.7 | 17.1 | 18.5 | 20.0 | 21.4 | 22.8 | 24.2 | 25.7 | 27.1 | 28.5 |
| 20 | 13.5 | 15.0 | 16.5 | 18.0 | 19.5 | 21.0 | 22.5 | 24.0 | 25.5 | 27.0 | 28.5 | 30.0 |

IV DRUGS PREPARATION AND ADMINISTRATION

**DOPAMINE INFUSION TABLE (Double Strength)
400mg in 50ml Normal Saline
Strength: 8mg/ml**

PREPARATION: Add 2 ampoule of 200mg/5ml Dopamine to 40ml of 0.9% Sodium Chloride. Draw up the solution with a 50ml syringe.

| DOSE MCG/KG/MIN | BODY WEIGHT (KG) | | | | | | | | | | | |
|--------------------|------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|
| | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| | Rate (ML/HR) | | | | | | | | | | | |
| 5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 |
| 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 | 3.2 | 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 | 4.1 | 4.5 | 4.9 | 5.3 | 5.6 | 6.0 | 6.4 | 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 | 5.6 | 6.2 | 6.8 | 7.3 | 7.9 | 8.4 | 9.0 | 9.6 | 10.1 | 10.7 | 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 | 7.5 | 8.3 | 9.0 | 9.8 | 10.5 | 11.3 | 12.0 | 12.8 | 13.5 | 14.3 | 15.0 |

DOPAMINE /DOBUTAMINE (Paediatrics)

In paediatric patient: Refer Frank Shann - Calculation of the composition of drug infusion

Dilution: <30 kg : 15mg/kg in 50ml 0.9% NS
>30 kg : 6mg/kg in 100ml 0.9% NS

Dose: 5-20mcg/kg/min

Rate : <30 kg : 1-4 ml/hr (5-20mcg/kg/min)
>30 kg : 5-20 ml/hr (5-20mcg/kg/min)

| BODY WEIGHT | <30 KG | >30 KG |
|--|--|--|
| DILUTION | 15 mg/kg of drug in 50 cc 0.9% normal saline | 6 mg/kg of drug in 100 cc 0.9% normal saline |
| Infusion rate (DOSE RANGE 5-20 MCG/KG/MIN) | 1-4 ml/hour | 5-20 ml/hour |

ESMOLOL INJECTION

Preparation: 100 mg/10 ml

Supraventricular tachycardia (special approval required - non KKM indication)

Loading dose: 500 mcg/kg/min over 1 minute (give undiluted)

followed by maintenance dose : 50 mcg/kg/min over 4 mins

e.g Body weight patient 60 kg

*1 mg= 1000 mcg

| | Dose | Option 1 (Bedside injection) | Option 2 (Infusion pump) |
|------------------|---|---|--|
| Loading dose | 500 mcg x 60 kg per min : =30 000 mcg per min = 30 mg over 1 minute | 3 ml undiluted over 1 minute | 3 ml undiluted over 1 minute |
| Maintenance dose | 50 mcg x 60 kg x 4 mins = 12000 mcg over 4 mins = 12 mg over 4 mins | Syringe out 12mg (1.2 ml) of esmolol 100mg/10ml and further dilute to 10ml with Normal Saline 0.9% Give bedside aliquot 2.5ml each minutes till 4 minutes | Calculate infusion in ml/hour: 12 mg over 4 minutes = (12mg/4 min) x 60 min = 180 mg per hour Syringe out 10 ml (100 mg/10ml vial undiluted to 10 ml syringe) , so 180 mg/10mg = run 18 ml/hour for 4 mins on infusion pump |

Dose may be titrated upward every 50 mcg/kg/min (not more frequently than every 4 mins to a max of 200mcg/kg/min.

Max dose 200 mcg/kg/min for 24-48 hours

(Ref: Dilution Protocol, Bhg Perkhidmatan Farmasi, Jabatan Kesihatan Negeri Selangor 2017
https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0007/306367/liverpoolEsmolol.pdf)

FENTANYL INFUSION

Preparation: 100mcg / 2mls

Dilute 200mcg (2 ampoules) of Fentanyl with NS to become 20 mls

200 mcg \rightarrow 20 mls

1 ml \rightarrow 200/20 = 10 mcg

Dose Infusion:

Dose range 0.5-1.5 mcg/kg/h

If 60kg pt may start with 3ml/h (30mcg/H)

Titrate to desired effect and BP

(Ref: Introductory Anaesthesia Handbook, Department Anaesthesiology & ICU HSAJB 3rd Edition)

FRUSEMIDE INFUSION

Preparation: 20mg/2ml ampoule

Bolus Dose: 20 - 40mg (max 160mg) undiluted IV slow bolus 5-10mins

Infusion Dose:

200mg (10 amps undiluted) = 20 mls in 20mls syringe

1 ml/hr = 10mg/hr

Run at **10-40 mg/h (1- 4 ml/h)**

Adult: maximum rate 4mg/min (exceeding this rate increase risk of ototoxicity).

Children: maximum rate of 0.5mg/kg/min (Ref: Lexicomp, Wolter Kluwer Clinical Drug Information)

**Required single dedicated line (preferably CVL) because risk for crystallisation is high when mix with other infusion.*

ALTERNATIVE

FRUSEMIDE + AMINOPHYLLINE (AMINOLASIX)

Preparation from ICU Sungai Buloh

**Aminophylline have properties to potentiate the effect of frusemide on kidney*

120mg Frusemide + 150mg Aminophylline diluted to 50ml NS (2.4:3 mg/ml)

and run **10ml/h** for first hour then continue at **2 ml/h**

GTN (GLYCERYL TRINITRATE) INFUSION

Preparation: 50mg/10mls

Syringe Pump: 50 mls

Method 1:

LOWEST CONCENTRATION DOSE: 100mcg/ml (*PREFER*)

Dilute 5mg (1ml) of IV GTN with 50mls of Normal Saline.

Rate: 3mls/hour = 5 mcg/min (*Document Rate on Syringe Pump & in Patient's Notes*)

5mg in 50 mls

50 ml → 5mg → 5000mcg

1 ml → 5000 / 50 → 100 mcg

1 ml /hr → 100 mcg /hr → 100 mcg / 60 min → 1.66 mcg / min

3 ml /hr = 5 mcg /min

Starting dose of infusion **5-20 mcg/min (3-12ml/h)**

Can increase up to **200mcg/min (120ml/h)**

Monitor BP every 5 minutes

Max concentration: 400mcg/ml. Higher concentration will be adsorbed to tubing

Starting dose 5mcg/min (3ml/hr), increase every 5mcg/min every 3-5 mins to 20mcg/min (12ml/h).

If no response at 20mcg/min, may increase by 10-20mcg/min every 3-5 mins

IV DRUGS PREPARATION AND ADMINISTRATION

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information

GTN (GLYCERYL TRINITRATE) INFUSION – Con't

Preparation: 50mg/10mls

Method 2:

HIGHEST CONCENTRATION: 400mcg/ml

20 mg IV GTN (4ml) dilute with NS to become 50 ml

Rate : 1ml/hr = 10mcg/min (*Document Rate on Syringe Pump & in Patient's Notes*)

20mg in 50 mls NS

50 mls → 20mg → 20000mcg

1 ml → 20000 / 50 → 400mcg

1 ml /hr → 400 mcg / hr → 400mcg / 60min → 6.67 mcg/min

1 ml /hr = 6.67 mcg/min

1.5 ml/hr = 10 mcg/min

Starting dose of infusion **5-20 mcg/min (0.75-3ml/h)**

Can increase up to **200mcg/min (30ml/h)**

Monitor BP every 5 minutes

Max concentration: 400mcg/ml. Higher concentration will be adsorbed to tubing

Starting dose 5mcg/min (0.75ml/hr), increase every 5mcg/min every 3-5 mins to 20mcg/min (3ml/h).

If no response at 20mcg/min, may increase by 10-20mcg/min every 3-5 mins

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information

HEPARIN INFUSION (For DVT / Pulmonary Embolus)

UFH is no longer the standard treatment in DVT & PE. Use LMWH

Bolus dose : 80 IU/KG

Infusion Dose : 18 IU/kg/hr

Preparation: 5000 IU /ml (BLUE label)

Syringe out 2 mls (10,000 IU)

Dilute with 10 ml of Normal Saline in 20 mls syringe

1 ml = 1000 IU

Dilution after IV Metylase given at **1 ml/h**

(Document rate on Syringe Pump & in Patient's Notes)

HUMAN ALBUMIN 4% (FLUID RESUSCITATION IN DENGUE SHOCK SYNDROME)

Usual available preparation: Human Albumin 20%

100 cc Human Albumin 20% dilute with 400 cc Normal Saline 0.9%
Infusion rate: 10-20 ml/kg over 1 hour

Ref: Malaysia CPG on Management of Dengue Infection in Adults (3rd Ed) 2015

HYDRALAZINE

For Pre-eclampsia / Eclampsia

Preparation: 20mg/ml

Method 1:

20mg + N/S = 20ml (1ml = 1mg)

Pre-eclampsia/eclampsia: **5-10mg** initially, followed by 5-20 mg every 20-30 minutes as necessary

Method 2:

Dilute 50 mg in 50cc NS

Dose : 1ml/hr = 1mg/hr (*Document Rate on Syringe Pump & in Patient's Notes*)

Start infusion 5ml/hr. Increase 1ml/hr every 15-20 mins

Max infusion rate - **10mls/hr (10 mg/hr)**

Aim Diastolic BP 90-100 mmHg

Caution when hydralazine if given together with MgSO₄ —> cause significant hypotension.

Hydralazine should be diluted in NS due to decreased stability in D5%, do not refrigerate it, can cause precipitation or crystallization

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information

HYPERTONIC SALINE

* *Hypertonic saline may be more effective than mannitol in lowering intracranial pressure but no difference was found in short-term mortality (Brain Trauma Foundation 2016)*

NACL 3%

Dose: 3-5 ml/kg Nacl 3% over 30 to 60 minutes

An adult usually 250 ml of Nacl 3% bolus *preferably through CVL* (due to high osmolarity & tonicity)

Aim Na level 145-155 mmol/l

IV DRUGS PREPARATION AND ADMINISTRATION

KETAMINE

Preparation: 200mg in 20ml vial

Induction dose for INTUBATION: 1-2mg/kg

Analgesia: 0.2-0.3 mg/kg bolus or 0.3mg/kg in 100ml Ns over 15min less feeling unreality.

Procedural Sedation Analgesia (PSA): 0.5-1.0 mg/kg and repeat 1/3 of the dose for 5-10 minutes

Or preferred: Ketamine and Propofol (Ketafol- 2 different syringes): 0.3mg/kg of Ketamine (analgesic dose) and propofol (sedative dose) titrate 40mg + 20mg + 20mg

Alternative for PSA

Ketamine and Propofol (Ketafol- in 1 syringe)

Ketofol (1:1 mixture of 5ml ketamine 10 mg/mL and 5ml propofol 10 mg/mL-) given aliquot **3 ml** till effect

The median dose of medication administered was ketamine at 0.75 mg/kg and propofol at 0.75 mg/kg

IV DRUGS PREPARATION AND ADMINISTRATION

IV Ketamine + Midazolam (Keta-Mida)

**Option for sedation post intubation especially for hyperactive airway such as status asthmaticus (disadvantages of tachycardia and increase salivation)*

To prepare in **SEPARATE/DIFFERENT** syringes:

IV Ketamine 200 mg/20ml (1 vial) 10mg/ml → undiluted 20ml put in 20ml syringe

IV Midazolam 30mg/6ml (2 ampules of 15mg/3ml) + NS = 30ml put in 50ml syringe

Loading dose

Give IV Bolus of 0.05mg/kg midazolam

e.g body weight 70 kg= 3.5 ml

Infusion dose range for Midazolam

Start at 1 mcg/kg/min (0.06 mg/kg/hr) of Midazolam

e.g body weight 70kg = 4 ml/hr

Infusion dose range for Ketamine:

0.6-3 mg/kg/hr of Ketamine

e.g body weight 70kg run 4 - 20 ml/hr

Increase infusion rate 1ml/hr every 20 mins till target RASS (i.e -2 to +1) achieved

Ref: Medication Reconstitution and Dilution Reference, Pharmacy Dept HSAJB 2013

LABETALOL

Preparation: 25mg/5ml

Bolus:

Non diluted:

Give 1ml= **5mg** bolus titrate up every 5 minutes up to 25mg (1 ampule). **Maximum dose 200mg**
Aim SBP not to lower than 160mmhg.

** Do not give bolus 1 ampule (25mg) stat*

Continuous infusion:

Transfer **100mg (4 amp)** into **20ml** syringe

(May be given undiluted) 1ml= 5mg run **0.5-2mg/min** (6ml/h to 24 ml/H)

Ref: preparation from Neurosurgery Department of Hospital Universiti Sains Malaysia (HUSM)

Or

Dilute to final concentration of 1mg/ml, eg: 200mg (8 ampules) in 200ml NS/D5%

Hypertensive crisis: 0.5-2mg/min (run @ 30ml/Hr-120ml/Hr). Max total dose 300mg

**NOT according to body weight*

Hypertension in pregnancy: 20mg/hr, doubled every 30 mins. Max dose 160mg/hr.

For hypertension bleed aim MAP reduction 25% from initial highest BP within 3-12 H

LABETALOL – Con't

*Incompatible with sodium bicarbonate

*Patient should receive drug in supine or left lateral position. Avoid raising patient into upright position within 3 hours which may cause excessive postural hypotension.

*Avoid severely elevated blood pressure to drop rapidly which may cause catastrophic reaction eg. cerebral infarction

Ref: Ministry of health Malaysia, Dilution Guide For High Alert Medications 2011

LIGNOCAINE INFUSION

** Second option for stable Ventricular Tachycardia after Amiodarone*

Preparation:

Lignocaine Injection 2% for IV (plastic ampule) not IM (glass ampule)
100mg in 5mls (20mg in 1 ml)

Dilute 400 mg in 50 ml D5% (8mg/ml)

Dose: (Cardio protocol)

0.125 ml/kg (1mg/kg) (Max 3mg/kg) over 3 mins (for 50 kg will be **6.25 ml bolus for 3 min**) followed by

0.5ml/kg (4 mg/min) x 30 mins
for 4mg/min= 240mg/h—> **30ml/h for 30 mins**

0.25ml/kg (2 mg/min) x 2 hours
for 2mg/min= 120mg/h—> **15ml/h for 2 hours then**

0.125ml/kg (1 mg/min)= 60mg/h—> **7.5ml/h as maintenance.**

MAGNESIUM SULPHATE

Preparation: 2.47 gm / 5mls (1 amp)

1. For Pre-eclampsia / Eclampsia

(HSAJB O&G protocol)

Loading dose:

4gm (8ml) in 20ml N/S run @ 80ml/Hr (over 15 min)

Maintenance dose:

1gm (2ml) in 50ml N/S run @ 50ml/Hr (1gm/Hr). Continue maintenance @ 1gm/Hr till delivery

Check patellar reflex before & during infusion, RR > 16, Urine Output > 25mls/hr

2. For Severe Asthma

Dosage:

Dilute 2 gm (4 mls) in 20cc NS

Give using syringe pump over 20 minutes (run 60ml/hr)

MAGNESIUM SULPHATE – Con't

3. For Tetanus (Management of autonomic dysfunction)

Dosage:

Magnesium sulfate, 40 milligrams/kg IV loading bolus, then
2 grams/h (1.5 grams/h if ≤ 45 kg) continuous infusion (Dilute 4 gm (8 mls) in 20cc NS run 10ml/h) to
maintain blood level of 2.0–4.0 mmol/L
(*Tintinalli 8th edition*)

4. Used in torsades de pointes with long QT interval

Dosage:

2 grams IV over 2 min, followed by infusion of 1–2 grams/h

MANNITOL INFUSION (Adult)

Preparation: 20 %

Dose:
1g / kg

To run over 30- 60 minutes

Use microchamber Drip or infusion pump

Calculations:

Body weight 50 kg

Mannitol 20 % meaning 20g in 100ml

Total volume of Mannitol needed (1 gm/kg) = 50g

= (100ml/20g) X 50g

=250 ml of Mannitol 20 % to run in 30 minutes

or **Rule of 2** ie 200ml of 20% mannitol run over 20 minutes

MANNITOL INFUSION (Paeds) *(Reference: APLS 5th edition)*

Preparation: 20%

Dose: 0.25 – 0.5 gm /kg (infusion over 30 to 60 minutes)

Can be repeated once or twice over an interval of 4-8 hours

Provided that serum osmolality < 310 mOsm/l

Use microchamber Drip or infusion pump

Calculations:

Body weight 10 kg

Mannitol 20 % ie 20gm in 100ml

Total volume of Mannitol needed (2.5 ml/kg)

10 kg x 0.5gm = 5 gm

= (100ml/20gm) x 5gm

= 25 mls of Mannitol 20% to run over 30 minutes

Preferable to use Hypertonic Saline (Normal Saline 3%) in cerebral oedema not Mannitol

Dose: 3-5 ml/kg NS 3 % over 30- 60 minutes

MIDAZOLAM-MORPHINE SEDATION (Adult)

Preparation:

Morphine 30 mg (3 mls) + Midazolam 30 mg (6mls)
Dilute with Normal Saline to **30 mls** in a 50mls syringe

Rate:

1mls/hr = 1 mg/hr of Midazolam and Morphine

Dose:

Infusion starting dose: 3ml/hr (3 mg/hr)

To titrate to desired effect

Bolus dose may be required for faster effect (3-5mls), followed by infusion dose

MIDAZOLAM-MORPHINE SEDATION (Paediatrics)

Midazolam infusion

Dilution: 3mg/kg in 50 mls D5%

Dose : 1-4 mcg/kg/min (**1 ml/hr = 1 mcg/kg/min**)

Run at 1-4 ml/hr

If patient is small, avoid giving too much fluid —> can be double concentration

i.e Midazolam 6mg/kg in total 50ml D5%
Run at 1-2 ml/hr (1 ml/hr = 2 mcg/kg/min)

Reference: Drug Doses Frank Shann 17th edition 2017

MIDAZOLAM-MORPHINE SEDATION (Paediatrics) – Con't

Morphine infusion:

Dilution: 1 mg/kg in 50ml D5%

Dose:

a) Children: 20-80mcg/kg/hr (1 ml/hr = 20mcg/kg/hr)

Run at 1-4 ml/hr

b) Ventilated neonate: 10-30mcg/kg/hr (1 ml/hr = 20mcg/kg/hr)

Run at 0.5-1.5ml/hr

Try not to dilute Midazolam & Morphine together

However if patient is small/fluid restricted:

- can dilute IV Midazolam 6mg/kg + IV Morphine 1mg/kg
- make up to total 50ml D5%
- run at 1ml/hr

Reference: Drug Doses Frank Shann 17th edition 2017

MIDAZOLAM-FENTANYL SEDATION

**Sedation of choice post intubation especially for hyperactive airway such as status asthmaticus (advantages of less tachycardia and no increase in salivation)*

Preparation:

300mcg (3 ampoules) of Fentanyl + Midazolam 30 mg
Dilute with NS to become **30mls** in 50mls syringe

Rate:

1mls/hr = 1 mg/hr of Midazolam AND 10 mcg/hr of Fentanyl

Dose:

Infusion starting dose: 3ml/hr

To titrate to desired effect

Bolus dose may be required for faster effect (3-5 mls), followed by infusion dose

N-ACETYLCYSTEINE (NAC) INFUSION

1. NAC DOSE FOR ACUTE LIVER FAILURE IN PCM POISONING

Preparation:

2 gm / 10 mls (1ml = 200mg)

Dosage:

- 150mg/kg (Maximum 15g) in 200 mls of Dextrose 5% over 15 – 60 mins
- Then 50mg/kg (Maximum 5g) in 500 mls of D5% over 4 hour
- Then 100 mg/kg (Maximum 10g) in 1 litre of D5% over 16 hours

e.g. : Body weight = 70 kg

150 mg/kg = 150 x 70 = 10500 mg = 10.5 gm

1 ampule = 2 gm

10.5 gm = 10.5/2 = Approximate 5 ampules

5 ampules of N-Acetylcysteine in 200 mls of Dextrose 5% over 15 min

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information

N-ACETYLCYSTEINE (NAC) INFUSION - Con't

2. NAC DOSE FOR ACUTE LIVER FAILURE IN NON-PCM POISONING

(such as in severe dengue with acute liver failure)

Preparation:

2 gm / 10 mls (1ml = 200mg)

Dosage:

- 150mg/kg in 200ml over 1 hour
- 50mg/kg in 50ml over 4 hours
- 50mg/kg in 50ml over 8 hours x 6 cycles (48 hours)

Ref: ICU protocol HSAJB (follow HKL protocol)

3. NAC DOSE FOR BURN INHALATION INJURY (WITH HEPARIN)

Preparation: Nebulization NAC (use IV NAC undiluted)

Dosage:

- 3ml NAC (600mg) + heparin 5000 IU (1ml of heparin blue label) every 4 hourly for 7 days.
- Total of 4 ml, to give as nebulizer.

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information

NALOXONE for Opiod Overdose

Preparation: 0.4 mg / ml

Dose:

I/V 0.4 mg – 2.0 mg

Repeated dose with interval of 2 – 3 mins

Max: 6 mg

Naloxone infusion:

0.3mg/kg in 30ml at 1ml/H (0.01mg/kg/h)

Ref: Lexicomp, Wolter Kluwer Clinical Drug Information and Drug Doses Frank Shann 17th edition 2017

NORADRENALINE INFUSION

Preparation: 4mg/4mls (1 amp)

Dilute 4.0 mg (4mls) of Noradrenaline with 46 mls of D5 in 50 mls syringe.

Administration in NS alone is not recommended. Lack of oxidation protection. (*Product Leaflet*)

Rate: 1ml/hr = 1mcg/min

Dose: 2 – 20 mcg/min. Titrate accordingly to desired response (0.05-0.5mcg/kg/min)

Calculations:

- Dilute 4mg Noradrenaline in 50mls D5 (*Preferably use single strength in ED*)
- 50mls \rightarrow 4mg \rightarrow 4000mcg
- 1ml \rightarrow $4000/50 = 80$ mcg
- 1ml/hr \rightarrow 80mcg/hr \rightarrow 80mcg/60min \rightarrow 1.3mcg/min
- 1ml/hr = 1.3 mcg/min (Max infusion rate 25ml/h for a 65kg patient)

IV DRUGS PREPARATION AND ADMINISTRATION

NORADRENALINE INFUSION TABLE

4mg in 50ml Dextrose 5%

Strength: 0.08mg/ml

PREPARATION: Add 1 ampoule of 4mg/4ml Noradrenaline to 46ml of Dextrose 5%. Draw up the solution with a 50ml syringe.

| DOSE MCG/KG/MIN | BODY WEIGHT (KG) | | | | | | | | | | | |
|--------------------|------------------|------|------|------|------|------|------|------|------|------|------|------|
| | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| | 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 | 7.5 | 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 | 11.3 | 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 | 13.5 | 15.0 | 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 |

OMEPRAZOLE/ PANTOPRAZOLE

Preparation: 40mg per vial

Dose for severe Upper Gastrointestinal Tract (UGIT) Bleeding: 80mg bolus then 8mg/ hour for 72 hours

a) IV Bolus:

Omeprazole: 80mg (2 vial) + 20ml solvent and give over 5 min (max rate 4ml/min)

Pantoprazole: 80mg (2 vial) + 20ml NS and give over 2-15 min

b) IV Infusion:

40mg (1 vial) + NS = 50ml

Run 8mg/hour (10ml/ hour)

*Ref: Product Leaflet Vaxcel Omeprazole & Pantoprazole
Lexicomp, Wolter Kluwer Clinical Drug Information*

PHENOBARBITONE INFUSION (Paeds)

(Preferable in <1 year old)

Preparation: 200mg/ml per vial

Loading Dose:

20 mg/kg (maximum loading dose 1 gm) over 30 minutes, additional 5-10mg/kg doses every 15-20 minutes as needed for refractory seizures up to total of 40mg/kg

Not more than 30mg/min in children, 60mg/min in adult (*Ref: Lexicomp, Wolter Kluwer Clinical Drug Information*)

Rapid IV administration may cause respiratory depression, apnoea, laryngospasm or hypotension.

Maintenance dose:

IV or PO 3-5mg/kg/day every 12 hours, starts 12-24 hours after loading dose

Dilution:

Dilute to 10 times its volume with diluent:

eg. Dose 200mg for BW 10kg: Dilute 1ml Phenobarbitone in 9ml NS to make 20mg/ml for IV Infusion

Administration:

Loading dose: slow IV run over 30 minutes.

Maintenance dose (after 12 hour of loading dose): slow IV bolus over 5 mins

Maximum rate do not exceed 1mg/kg/min.

Ref: Neonatal Intensive Care Unit, Drug Protocol 2013

Frank Shann 16th edition

Paediatric Protocols for Malaysian Hospitals -3rd edition

PHENYTOIN (DILANTIN) INFUSION (Adult & Paeds)

Preparation: 250 mg / 5mls

Loading dose (Adult):

15-20 mg/kg (Maximum dose 1.5 gm)

Dilute in 100 mls of Normal Saline (final concentration should not exceeding 10mg/ml)

Use microchamber or Infusion pump

Run over 1 hour (Rate not exceeding 50 mg/minute)

Maintenance dose (Adult):

IV or Oral: 100 mg every 6 to 8 hours

Loading dose (Paeds > 1 year old):

15-20mg/kg (maximum loading dose 1.5gm)

Dilute in 50ml-100ml Normal saline (final concentration should not exceeding 10mg/ml)

Run over 1 hour → cardiac monitoring

Rate not exceeding 1-3mg/kg/min

Flush the line with normal saline before and after infusion to avoid local venous irritation due to alkalinity of solution

Do not dilute in D5%- cause crystallization

(Ref: Frank Shan & Product Leaflet)

PRALIDOXIME for Organophosphate Poisoning

(Oximes be given to all symptomatic patients who need atropine)

Preparation: Single dose vial 1 gm

Loading Dose

Adult : IV 1-2 gm (in 100mls 0.9% NS) given over 15-30 mins

Children : 20-40 mg/kg over 30-60mins (Maximum 2g/dose)

Loading dose should not be given rapid - vomiting (risking aspiration), tachycardia & diastolic hypertension

May repeat after 1 hour if muscle weakness persists, additional doses every 10-12 hours as needed for persistent muscle weakness. Maximum dose 12g in 24hours.

(Ref: Micromedex & Product Leaflet)

Infusion:

250-500 mg/hr, titrating to symptoms (Children 10-20 mg/kg/hr)

WHO:

Loading dose 30mg/kg, then infusion 8mg/kg/hr

Response seen after 10-40 mins of administration

PROTHROMBIN COMPLEX CONCENTRATE (OCTAPLEX)

For bleeding due to overwarfarinazation (need Haematologist authorization)

Preparation: 500 IU per vial with 20ml water for injection

Active ingredient: Human coagulation factor II, VII, IX, X, Protein C, Protein S

Dose:

| Initial INR | 2.0-2.5 | 2.5-3.0 | 3.0-3.5 | >3.5 |
|---------------------------|-----------------|-----------------|-----------------|-------------|
| Approximate Octaplex dose | 22.5-32.5 IU/KG | 32.5-40.0 IU/KG | 40.0-47.5 IU/KG | >47.5 IU/KG |

The single dose should not exceed 3000 IU (120 ml Octaplex)

Method of administration:

Inject the solution intravenously at a slow speed: Initially 1 mL per minute, not faster than 2 - 3 mL per minute

The patients pulse rate should be measured before and during the infusion. If a marked increase in the pulse rate occurs, the infusion speed must be reduced or the administration must be interrupted.

No blood must flow into the syringe due to the risk of formation of fibrin clots.

Ref: Octaplex product leaflet

MOH Clinical Practice Guidelines Prevention and Treatment of Venous Thromboembolism

IV DRUGS PREPARATION AND ADMINISTRATION

Instructions for reconstitution:

1. If necessary, allow the solvent (Water for Injections) and the powder in the closed vials to reach room temperature. This temperature should be maintained during reconstitution. If a water bath is used for warming, care must be taken to avoid water coming into contact with the rubber stoppers or the caps of the vials. The temperature of the water bath should not exceed 37°C.

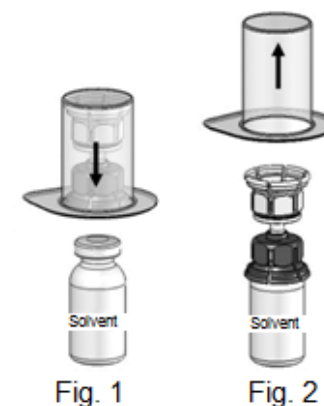
2. Remove the caps from the powder vial and the water vial and clean the rubber stoppers with an alcohol swab.

3. Peel away the lid of the outer package of the Mix2Vial™. Place the solvent vial on an even surface and hold it firmly. Place the blue part of the Mix2Vial™ on top of the solvent vial and press firmly down until it snaps (Fig. 1). While holding onto the solvent vial, carefully remove the outer package from the Mix2Vial™, being careful to leave the Mix2Vial™ attached firmly to the solvent vial (Fig. 2).

4. Place the powder vial on an even surface and hold it firmly. Take the solvent vial with the attached Mix2Vial™ and turn it upside down. Place the transparent part on top of the powder vial and press firmly down until it snaps (Fig. 3). The solvent flows automatically into the powder vial.

5. With both vials still attached, gently swirl the powder vial until the product is dissolved. Octaplex dissolves quickly at room temperature to a colourless to slightly blue solution. Unscrew the Mix2Vial™ into two parts (Fig. 4). Dispose the empty solvent vial with the blue part of the Mix2Vial™.

6. Attach a 20 mL syringe to the transparent part of the Mix2Vial™. Turn the vial upside down and draw the solution into the syringe. Once the solution has been transferred, firmly hold the plunger of the syringe (keeping it facing down) and remove the syringe from the Mix2Vial™. Dispose the Mix2Vial™ and the empty vial.



PROTHROMBINEX-VF (HUMAN PROTHROMBIN COMPLEX)

For severe bleeding in Trauma (off label)

Preparation: 500 IU per vial with 20ml water for injection

Active ingredient: Human coagulation factor II, IX, X, Human plasma proteins (including low levels of factors V and VII), Antithrombin III, Heparin sodium (porcine origin)

Dose: 25-50 IU/KG

| Initial INR | 1.5-2.5 | 2.6-3.5 | 3.6-10.0 | >10.0 |
|------------------------------|---|---------|----------|-------|
| | Dose of Prothrombinex-VF (IU/kg) | | | |
| Target INR | | | | |
| Complete reversal 0.9-1.3 | 30 | 35 | 50 | 50 |
| Partial reversal 1.4-2.0 | - | 25 | 30 | 40 |

Method of administration:

Give the dose slowly approximately 3 mL per minute or as tolerated by the patient

*Ref: Prothrombinex-VF Product Leaflet
Oral anticoagulants in Trauma Guideline version 2017*

IV DRUGS PREPARATION AND ADMINISTRATION

Instructions for reconstitution:

1. Before reconstitution, allow the vials of Prothrombinex®-VF and Water for Injections to reach a temperature between 20°C and 30°C.
2. Remove the caps from the top of the Prothrombinex®-VF and Water for Injections vials.
3. Apply a suitable antiseptic to the exposed part of the rubber stoppers of both Prothrombinex®-VF and Water for Injections and allow to dry.
4. Open the outer package of the Mix2Vial™ filter transfer set by peeling away the lid. Place the Water for Injections on a level surface and hold the vial firmly. Take the Mix2Vial™ together with its outer package and invert it. Push the blue plastic cannula of the Mix2Vial™ firmly through the rubber stopper of the Water for Injections.
5. While holding onto the vial of Water for Injections, carefully remove the outer package from the Mix2Vial™, being careful to leave the Mix2Vial™ attached firmly to the Water for Injections vial. Ensure that only the package and not the Mix2Vial™ is removed.
6. With the Prothrombinex®-VF vial held firmly on a level surface, invert the Water for Injections with the Mix2Vial™ attached and push the transparent plastic cannula end of the Mix2Vial™ firmly through the Prothrombinex®-VF stopper. The water will be drawn into the vial by the vacuum within.
7. With the Water for Injections and Prothrombinex®-VF vial still attached, gently swirl the product vial to ensure the product is fully dissolved. Avoid excessive frothing. A clear or slightly opalescent solution is usually obtained in 10 minutes or less.
8. Once the contents of the Prothrombinex®-VF vial are completely dissolved, firmly hold both the transparent and blue parts of the Mix2Vial™. Unscrew the Mix2Vial™ into two separate pieces, and discard the empty Water for Injections vial and the blue part of the Mix2Vial™ in an appropriate waste container.
9. With the Prothrombinex®-VF vial upright, attach a plastic disposable syringe to the Mix2Vial™ (transparent plastic part). Invert the system and draw the reconstituted Prothrombinex®-VF into the syringe by pulling the plunger back slowly. One large syringe may be used to pool several vials of reconstituted Prothrombinex®-VF.
10. Once the Prothrombinex®-VF has been transferred into the syringe, firmly hold the barrel of the syringe (keeping the syringe plunger facing down) and detach the Mix2Vial™ from the syringe. Discard the Mix2Vial™ (transparent plastic part) and empty Prothrombinex®-VF vial in an appropriate waste container. Fit the syringe to a suitable injection needle to administer the reconstituted Prothrombinex®-VF. Do not use the Mix2Vial™ for injection.

SALBUTAMOL (VENTOLIN) INTRAVENOUS- Adults

Preparation: 0.5mg/ml

(Strength 5mg/5ml is indicated for Prem Labour only in Drug Formulary, 2018)

Loading dose:

250mcg over 10 mins

(0.25ml dilute in 10ml N/S run @ 60ml/Hr)

Slow IV:

Dilute 1ml in 10ml NS (Final concentration: 50mcg/ml)

Maintenance:

3mg + N/S = 50ml

* ml/hr = * mcg/min

Dose: 5-20 mcg/min (5ml/Hr-20 ml/Hr) (increments at 15-30 mins, if necessary) *(Product Leaflet)*

SNAKE ANTIVENOM (FREEZE DRIED)

Antivenom administration

Choice of antivenom must be selected by a physician trained and familiar with management of snakebite in Malaysia. All antivenom is administered intravenously.

Adrenaline should be prepared in readiness to treat possible anaphylaxis, that may occur in response to antivenom. This must be prepared before the administration of antivenom (0.5 mg for adults and 0.01mg/kg body weight for children (0.1% solutions, 1 in 1,000 dilution, 1mg/ml)

Recommended method of administration:

Intravenous infusion

- i. Reconstitute freeze-dried antivenom with the solution supplied or 10ml water for injection (WFI). ***Gently swirl (never shake) to dissolve the freeze-dried antivenom.***
- ii. Reconstituted solution is further diluted with 5-10ml per kg body weight of NS/D5% for children or 250-500ml NS/D5% for adult.
- iii. Antivenom mixture should be infused starting slow (1 to 2 ml/min) over 10-15 min then increased to a higher rate if no reaction to complete within a period of one hour or earlier.

Patient must be monitored during and for at least one hour AFTER completion of intravenous infusion. Serially chart vital signs and clinical progression.

(For Dosage of AV kindly refer to Guideline Management of Snakebite Ministry Of Health Malaysia, 2017)

SODIUM BICARBONATE (NaHCO₃) 8.4%

Preparation: 10mmol in 10ml with 1mEq/ml bicarbonate.

Indication for severe metabolic acidosis

Dosage depend on Base Excess/ HCO₃ level dan body water of patient

Calculation:

(24 - pt's HCO₃) or BE X BW X 0.6 X 1/3 = Z ml

And only give 1/2 from Z

or BE X BW/10 (*Frank Shan*)

IV Slow Bolus for Emergency case:

Give undiluted solution. Rate not exceeding 10mEq/minute (equivalent to 10ml/minute)

For infants, dilute 1mEq/ml solution 1:1 with WFI

IV Infusion:

Dilute with D5 to a maximum concentration of 0.05mEq/ml, run over 2 hours.

Maximum rate is 1mEq/kg/hr

(*Ref: LexiComp & Critical Care Pharmacy Handbook, 2010*)

SODIUM BICARBONATE (NaHCO₃) 8.4% - Con't

Indication for Alkaline Diuresis

(Salicylate Poisoning or Rhabdomyolysis)

75 ml of IV Sodium Bicarbonate 8.4% + 425ml of Dextrose 5% (becomes NaHCO₃ 1.26%) and run accordingly to 1.5 to 2 times patient maintenance.

Urine PH aim to achieve more than 6.5

STREPTOKINASE INFUSION

For STEMI

Preparation: 1.5 MU vial

Reconstitute with 5ml of NS/WFI

Further dilute into 95mls of Dextrose 5 % or NS in a Microchamber or infusion pump.

(Product Leaflet)

(1.5 Mega Unit (1 vial) + N/S = 100ml

Run over 1Hr via **50ml syringe**

(i.e: 2 syringes run 100ml/H)

Do Not SHAKE to prevent FOAMING

Observe

- BP every 15 mins (every 5 mins at the start of infusion)
- Hypotension, Gum bleeding, Epistaxis, Allergy
- If complication occurs kindly inform Emergency Physician.

STREPTOKINASE INFUSION - Con't

For Pulmonary Embolism (CCU protocol)

Dosage:

250 000 iu over 30 mins, then
100,000 iu /hour over 24 hours

Dilute 1 vial (1.5 MU) in 500 cc NS
1 ml = 3000 iu

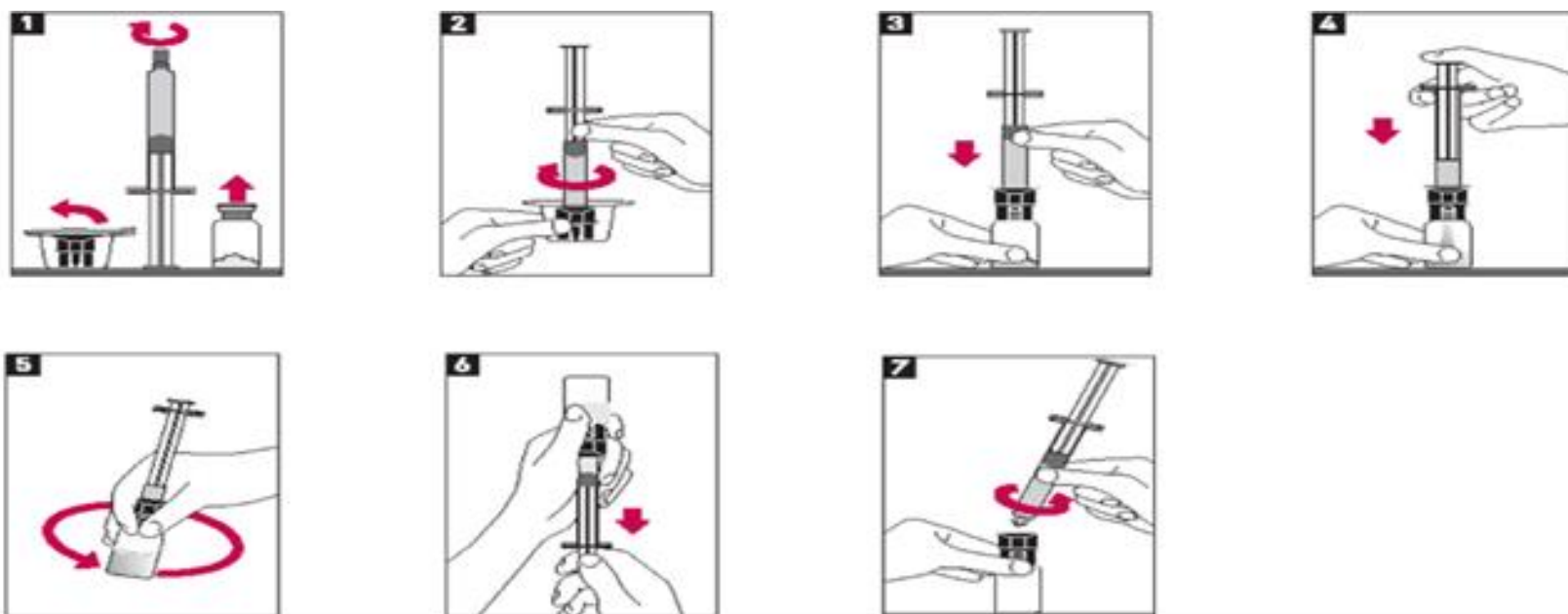
For 1st 250 000 iu = 83 ml run over 30 mins

Then 100 000iu = 33 ml/ hour over 24 hours

TENECTAPLASE (METALYSE)

(For STEMI)

Metalysé should be reconstituted by adding the complete volume of solvent provided in the pre-filled syringe to the vial of Metalysé powder for solution for injection solvent via the connector provided (see picture below)



IV DRUGS PREPARATION AND ADMINISTRATION

Check that the cap of the vial is still intact.

Remove the vial cap and connect immediately the pre-filled-syringe to the Luer lock of the Bioset.

Activate by pressing the connected syringe down until a click sound confirms that it is engaged.

Add the water for injections into the vial by pushing the syringe plunger slowly down to avoid foaming.

Reconstitute by swirling gently.

The reconstituted preparation results in a colourless to pale yellow, clear solution. Only clear solution without particles should be used.

Directly before the solution will be administered, invert the vial with the syringe still attached, so that the syringe is below the vial.

Withdraw into the syringe the appropriate volume of reconstituted solution of Metalyse, based on the patient's weight.

Disconnect the syringe from the vial.

Metalyse is to be administered to the patient, intravenously in about 10 seconds. It should not be administered in a line containing dextrose.

Any unused solution should be discarded.

Dose and volume to be withdrawn and administered to patient are according to body weight as in table below:

| Patients' body weight category (kg) | Volume of reconstituted solution (ml) | Tenecteplase (U) | Tenecteplase (mg) |
|-------------------------------------|---------------------------------------|------------------|-------------------|
| < 60 | 6 | 6,000 | 30 |
| ≥ 60 to < 70 | 7 | 7,000 | 35 |
| ≥ 70 to < 80 | 8 | 8,000 | 40 |
| ≥ 80 to < 90 | 9 | 9,000 | 45 |
| ≥ 90 | 10 | 10,000 | 50 |

TRANEXAMIC ACID

Bolus: 1gm over 10 mins

Infusion: 1gm in 500ml N/S over 8Hrs

* *Line should not mix with blood transfusion*

(CRASH 2 trial-within 3 H of injury)

VITAMIN K

For Bleeding in over warfarinization (not for pt with any heart valve replacement)

(CPG on Venous Thromboembolism (VTE), KKM 2013)

a) Major bleed (Life/Limb threatening)

IV Vitamin K 5 mg

Dilute dose in minimum of 50ml NS (*Ref: Lexicomp, Wolter Kluwer Clinical Drug Information & Micromedex*)

run over 30 mins (@ 50ml/Hr) (rate: 0.16mg/min)

b) Non- major bleed

IV Vitamin K 1-3 mg

Dilute dose in minimum of 50ml NS

run over 30 mins (@ 50 ml/Hr) (rate:0.03-0.1mg/min)

Maximum infusion rate: 1mg/min

IV route should be used in major bleeding patient. IM route should be avoided due to risk of hematoma formation.

(Ref: Lexicomp, Wolter Kluwer Clinical Drug Information)

COMMON ANTIBIOTICS IN ETD

(Detail indication and dosage refer to Guide to Antimicrobial Therapy in Adult ICU 2017 by Malaysian Society of Intensive Care and Product Leaflet of each item)

1. Augmentin 1.2g

(Amoxicillin 1g +Clavulanate 200mg)

Dosage: IV Augmentin 1.2g q8h

Dilute 1.2 g with 20 ml WFI *(Must be used within 20mins after reconstitution)*

IV Bolus 3-5 mins

2. Ampicillin 500mg

Dosage: IV Ampicillin 2g q6h

Dilute 500 mg with 10 ml WFI

IV Bolus 3-5 mins

**(Rapid Bolus may cause convulsive seizure)*

3. Unasyn 1.5g

(Ampicillin 1 g + Sulbactam 500 mg)

Dosage: IV Unasyn 3g q6h

Dilute 1.5g with 3.2ml WFI

IV Bolus 3-15mins (SLOW)

4. Azithromycin 500mg

Dosage: IV Azithromycin 500mg q24h

Dilute 500mg with 5ml WFI

Further dilute for IV Infusion:

with 500ml NS over 3hours (1mg/ml)

or

with 250ml NS over 1hours (2mg/ml)

NOT for IM or IV bolus

IV Infusion Over a **minimum of 1 hr**

**(Rapid infusion may cause arrhythmias and hypotension)*

5. Benzylpenicillin (Penicilline G)

1 MIU or 5 MIU
(600 mg = 1 MIU)

Dosage: 50,000 IU/kg 6H or 30-50mg/kg 6H, 1mg=1667 IU (*Frank Shann*)
For Leptospirosis- IV Benzylpenicillin 2 million units q6h

IV

Dilute 1MIU with 10ml NS (60mg/ml or 100,000 IU/ml), syringe out required dose
Eg. BW: 10kg for dose 500,000 IU, syringe out 5ml to serve patient
IV bolus over 5mins

IM

Dilute 1MIU with 1.6ml WFI

6. Cefepime 1g

Dosage: IV Cefepime 2g q8h

Dilute 1g with 10ml WFI
IV Bolus 3-5 mins

Further dilute for IV Infusion with 50ml NS (20mg/ml)
IV Infusion over 30mins

7. Cefoperazone 1g

Dosage: IV Cefoperazone 2g q12h

Dilute 1g with 10ml WFI / NS

IV bolus 3-5min

8. Cefotaxime 1g

Dosage: IV Cefotaxime 2g q8h

Dilute 1g with 5ml WFI

IV bolus 3-5min

9. Ceftazidime 1g

Dosage: IV Ceftazidime 2g q6h

Dilute 1g with 10ml WFI

IV bolus 3-5min

10. Ceftriaxone 1g

Dosage: IV Ceftriaxone 2g q12h

Reconstitute 1 gm with 9.6 ml WFI/ NS

Further dilute for IV Infusion with 50ml-100ml NS, recommended concentration 10-40mg/ml

Eg, 2gm in 50-100 ml NS (20-40 mg/ml)

IV infusion over 30mins (*Ref: Lexicomp, Wolter Kluwer Clinical Drug Information & Micromedex*)

IV Bolus over 2-5mins may cause tachycardia, diaphoresis, restlessness and palpitations.

(*Ref: Lexicomp, Wolter Kluwer Clinical Drug Information*)

11. Cefuroxime 750mg

Dosage: IV Cefuroxime 1.5g loading and 750mg q8h

Dilute 750mg with 10ml WFI

IV bolus 3-5min

12. Cloxacillin 500mg

Dosage: IV Cloxacillin 2g q4h

Dilute 500mg with 10ml WFI

IV Bolus 3-5 mins

13. Meropenem 1g or 500mg

Dosage: IV Meropenem 2g q8h

Dilute to concentration of 50 mg/ml
ie 500 mg with 10 ml WFI/NS
or 1 g with 20 ml WFI/NS

IV bolus 3-5min

14. Metronidazole 500 mg/100 mL

Dosage: IV Metronidazole 500mg q8h

Withdraw required dose without further dilution.

IV Infusion over 30-60mins (5ml/min)

15. Tazocin 4.5g (Piperacillin 4 g + Tazobactam 500 mg)

Dosage: IV Tazocin 4.5g q6h

Dilute 4.5g with 20ml NS
Further dilute for IV infusion with 50ml NS

IV Infusion over 30mins

ELECTROLYTES CORRECTION IN ED

1-Hyponatremia

Rapid correction should not exceed more than 12 mmol/ 24 H or 0.5 mmol/H to avoid Osmotic Demyelinating Syndrome (ODS); previously Central Pontine Myelinosis (CPM)

Calculation.

- 1-First, calculate the expected change in serum sodium from the infusion of a liter of saline solution.
- 2-Second, determine the portion of the liter required to raise the sodium the desired amount
- 3-Third determine duration for correction to avoid ODS

Examples.

Correction for 50 y/o male with weight 70kg having seizure secondary to Na 108mmol/l, using 3% Normal saline (consist of Na 513mmol/Liter) -if using NaCl 0.9% consist of 154mmol/L will lead to overload.

1- Total sodium deficit= Total Body Water (TBW) X (desired Na - current Na)

$$[0.6 \times \text{BW}] \times (130 - \text{current Na})$$

$$[0.6 \times 70] \times (130 - 108) = 924 \text{ mmol/l}$$

2- NACL 3%—> 513mmol per Liter

$$924 \text{ mmol} = (1000\text{ml}/513) \times 924$$

$$= 1800 \text{ ml of NACL 3\%}$$

3- Duration

$$0.5 \text{ mmol/H} \rightarrow 22/0.5 = 44 \text{ hours}$$

Thus infusion rate of NACL 3% will be 41ml/H

(Document time of start till time of ending examples from 0800H 23.08.18 till 0400H 25.08.18)

However, the does of correction may change according to result of sodium preferably bd BUSE)

2-Hyponatremia

Calculation of total body water (TBW) deficit.

$$\text{TBW deficit (L)} = \text{TBW} \times [(\text{measured Na} / \text{Normal Na}) - 1]$$

Example

Patient BW 60kg with Na 170mmol/l

$$\begin{aligned} \text{Calculation of TBW deficit} &= (60\text{kg} \times 0.6) \times [(170/150) - 1] \\ &= 4.8 \text{ liter} \end{aligned}$$

To avoid cerebral oedema correction should slower within 48H to 72 H

Thus to give Dextrose 5% 4800ml over 48H = 100ml/h

or if pt intubated with Ryle's tube may give water through the RT in divided dose ie 2.4L/day ie 600ml of water every 6 hly

3- Hypokalaemia

Do an ECG- if have changes ie u waves, need a fast correction or patient is symptomatic such as in Periodic Paralysis

Rule of 2 ie 2 gram of KCL in 200ml of Ns run for 2 hours

or

Dilute 2g in 100ml NS (*Medication Reconstitution & Medication Dilution HSAJB, 2013*)

Maximum 0.4mmol/kg/hour (20-30mmol/hour)

1 g KCL = 13.4 mmol K

if patient is 50kg

$0.4 \times 50 = 20 \text{mmol} \rightarrow 1.65 \text{ g KCL over 1 hour infusion}$

Maintenance: 2-4 mmol/kg/day

If patient 50kg \rightarrow for 2 mmol/kg/day will be 100mmol \rightarrow 7.5g of KCL per day.

If patient in 2 liters of maintenance drip ie 4 pints of NS thus may put 2 g KCL in each pints.

Peripheral infusion: Maximum concentration is 100mEq/100ml. Maximum rate is 10mEq/h.

Central infusion: Maximum concentration is 40mEq/100ml. Maximum rate is 40mEq/h.

There is extravasation risk if concentration more than 0.1mEq/ml is used.

(Ref: LexiComp)

4. Hyperkalaemia

-refer cocktail regime page 19