

# C&C Anaesthetic Crisis Handbook

Clickable links:

v3.3 Feb 2023

Treating known

## EMERGENCIES

**DIAGNOSING**  
Problems

**ADULT DRUG**  
Formulary

**TELEPHONE**  
Directory

**PAEDS DRUG**  
Formulary

### For every crisis:

- **Verbalise** the problem. Say out loud: 'This is a **CRISIS**'
- Call for **HELP** early
- **Set oxygen to 100%** (except where stated otherwise)
- Identify a '**hands off**' **Team Coordinator**
- **Delegate duties** to **specific** team members
- Use **closed loop**, quiet & efficient **communication**
- Use the **indexed pages** & **coloured boxes** in this manual to **assist you**

[www.AnaestheticCrisisHandbook.com](http://www.AnaestheticCrisisHandbook.com)

(Created by Adam Hollingworth with help from many people along the way)  
(C&C version localised by Hannah Janssens & Eilidh Menzies)

Adapted from various sources including:

- Guidelines: ANZAAG, AAGBI, NZRC, Starship Protocols
- vortexapproach.org. Dr Chrimes & Dr Fritz
- Hutt Valley & CCDHB: Clinical protocols
- ESA Emergency Quick Reference Guide
- CCDHB Crisis Checklists. Dr A McKenzie
- Emergencies in Anaesthesia. Oxford Handbook
- Wellington ICU Drug Manual. Dr A Psirides & Dr P Young
- Various published peer reviewed papers

# Instructions for Use

- Use the **index** and **coloured tabs** to find quick reference pages to assist in a crisis.
- The **handbook is in 2 parts**:
  - The front book: How to treat known **Emergencies**
  - The back book: How to **Diagnose** Problems
- **Routine/obvious tasks** (eg call for help, turn oxygen to 100%) are assumed & thus **not** repeated on every sheet for clarity
- For simplicity & to avoid calculation errors in an emergency, **drug doses** are given for a **70 kg adult**. Paeds doses are clearly marked with 🧒 (where appropriate).
- There is an adult & paediatric drug formulary at the back
- Cards are arranged into coloured boxes:
  - Emergency/Doing tasks
  - Thinking tasks, diagnostic or further information
  - Doses, equipment or calculation information
- Work through emergency/doing boxes in a linear fashion. Decision making steps are **highlighted** for clarity.

Using an aid such as this efficiently, in a crisis, is a **learned** skill. You must take time to become **familiar** with this manual and **practise** using it.

It is recommended that a 'reader', with no other tasks, **read these cards out loud** to the team leader during the crisis.

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Breathing

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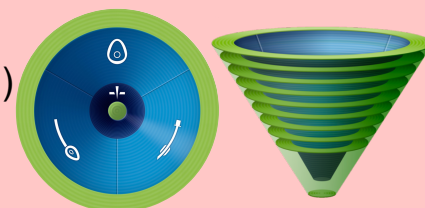
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# 1e. AIRWAY MANAGEMENT - Vortex

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




Main priority = **Oxygenation in the green zone**

- Always prepare a **safe airway strategy** - e.g. AFOI, call ENT surgeon etc.
- Pre-oxygenate** all patients
- Consider **passive apnoeic oxygenation** with nasal cannula during RSI
- Remove cricoid early
- Address all airways with the **Vortex Approach** ( See Dr Chrimes vortexapproach.org )



## If failure of first airway plan:

- Get difficult intubation trolley and extra help
- The goal is to **restore oxygenation** & reach the **green zone** (= EtCO<sub>2</sub> & safe SpO<sub>2</sub>)  
(safe SpO<sub>2</sub> = SpO<sub>2</sub> where no harm will occur if that level persists for 15mins)
- Try the **lifelines** (BMV, SGA, ETT) in any order
- For each lifeline perform at least **1 attempt**, but **not more than 3**  
(You may have a 4th attempt if a **game changer** becomes available e.g. new equipment, expert help etc.)
- Suggested optimisations include:

	Bag/Mask 	SGA 	ETT 
	Dentures in 2 hands Vice grip	Pull tongue forward Twist to insert	Dentures out Laryngeal manipulation Remove cricoid
	Cuff inflation/deflation	Cuff inflation/deflation	Lift epiglottis
	OPA NPA	Insert with laryngoscope/bougie	Bougie/Stylet
	Change size	Change size Change type	Change ETT size Change blade Use video scope
	Suction foreign material		
	Muscle paralysis		

(A **best effort** at any lifeline must include full **muscle paralysis**)

- If in the **Green Zone**: Develop a **strategy** for ongoing **safety** (some examples):
  - **Maintain** = Consider **waking patient**: **sugammadex 1.2g**, **naloxone 400mcg**
  - **Convert** = Place ETT using **fiberoptic scope** through SGA *or* **surgical** airway
  - **Replace** = Leave green zone and **re-enter vortex**
- With an **unsuccessful best effort** at any lifeline: Escalate the **CICO status**:
  - **Ready** = Get CICO kit, designate proceduralist
  - **Set** = Ready equipment & palpate landmarks
  - **Go** = If not in the Green Zone after 3 lifeline best efforts:  
Optimise patient position & start **CICO Rescue** tab 2e

- **sugammadex** = immediately post roc/vec = 1.2g or 6 x 200mg vials (🧑‍⚕️ 16mg/kg)
- **naloxone** = 400mcg bolus (🧑‍⚕️ 10mcg/kg)

Main priority = **Oxygenation with stable SpO<sub>2</sub> >90%**

- Dedicated team** continuing to attempt **oxygenation supraglottically**
- Pull patient up bed so head extends over pillow
- 3 options for **CICO Rescue** (decide & **share** with team **early** your intended **technique**):

## 1. Cannula Cricothyroidotomy (palpable neck anatomy):

- CICO Pack**: 14G cannula, 5ml syringe (with 2ml NSL), Rapid O<sub>2</sub> (insufflation device)
- Secure cricoid cartilage & **aspirate** as you **advance** the saline filled cannula
- Success = **free aspiration of air** - never let go of cannula
- Connect **Rapid O<sub>2</sub> device** to cannula & machine aux O<sub>2</sub> port (10L/min @ flowmeter):
  - **1st breath**: 6 secs (1000mls) - look for chest **rise & fall**
  - **Wait 20 secs** for **SpO<sub>2</sub> rise** or when SpO<sub>2</sub> starts to **drop** by 5% from **peak**
  - **2nd breath**: 3 secs (500mls) & **repeat only** after waiting as previous step
  - If **no ↑ SpO<sub>2</sub>** after **2nd breath** or **any doubt** then **abandon** technique
- Convert to size 5 airway using Seldinger cricothyrotomy **catheter** set (on DI trolley)

## 2. Scalpel Bougie (palpable neck anatomy):

- Prepare gauze/**swabs** & **suction** for blood
- Method (with 10 blade scalpel):
  - **Horizontal** stab incision through cricothyroid membrane
  - **Rotate scalpel** to vertical (blade caudad) and pass **bougie** alongside blade
  - Remove scalpel, railroad **size 6** ETT over bougie

## 3. Scalpel, Finger, Cannula/Scalpel (non-palpable anatomy):

- Prepare gauze/**swabs** & **suction** - there may be a lot of blood
- Method:
  - Vertical **midline 8-10cm** incision through skin & subcutaneous tissue
  - Use both hands to **blunt dissect** down to airway & **secure** cartilage
  - Insert cannula or scalpel through cricothyroid **membrane** or **trachea**
  - Follow step 1 or 2 as above to oxygenate patient

- Choice of 1st method is operator's personal preference. Decide on your preferred method & practise it - mentally or in a simulation
- If 1st method is unsuccessful move to alternative method immediately
- If no palpable anatomy: scalpel finger method is recommended

Main Priority: Break laryngospasm & maintain SpO<sub>2</sub>

- Ask surgeon to stop
- Get **drugs** & **airway equipment**
- Manual procedures:**
  - Remove LMA & clear the airway
  - Consider OP/NP airway
  - **Jaw thrust & CPAP 30cmH<sub>2</sub>O** - **do not** give +ve pressure breath
  - Apply bilateral, painful, inward pressure to **Larson's point** (immediately behind lobule of ear)
  - If 🧘: Consider gentle chest compressions (may be more effective than other manual procedures)
- If **SpO<sub>2</sub> stable & >92%** try low dose muscle relaxation:
  - (note paed/obese/acutely unwell desaturate very quickly - consider going straight to intubation)
  - **Propofol** - 20% of induction dose
  - **Suxamethonium IV 35mg** (🧘 0.5mg/kg)
- If **SpO<sub>2</sub> dropping or <92%** give full dose muscle relaxation ASAP:
  - Adult: **Suxamethonium 100mg**
  - Paeds: **Suxamethonium IV: 2mg/kg; IM 4mg/kg**
- Consider **atropine 600mcg** (🧘 20mcg/kg) for bradycardia
- Consider stomach decompression after event

- Laryngospasm will break with sufficient time & hypoxia but may be preceded by **bradycardia, cardiac arrest, aspiration, pulmonary oedema**
- Hypoxia may occur rapidly in paed, obese +/- acutely unwell patients
- **Pre-prepare IV & IM doses of suxamethonium** in such cases (🧘 **tab 9e**)

## Drug &amp; Equipment dosing

- Paediatric (uncuffed) ET Tube: preterm = 2.5; <1yr = 3.5 - 4; >1yr = (age/4)+4 **tab 9e**
- **Propofol**: 20% induction dose
- **Suxamethonium**:
  - relaxation = 0.5mg/kg IV
  - intubation:
    - adult: induction dose or 100mg
    - paed: IV 2mg/kg; IM 4mg/kg

**Main Priority: SpO<sub>2</sub> >95% with Peak Airway Pressures <40cmH<sub>2</sub>O**

- Inform surgeon. Minimise surgical stimulation
- Check:**
  - Airway position
  - EtCO<sub>2</sub> trace (severe bronchospasm can present with low or absent EtCO<sub>2</sub>)
  - Airway pressures
- Manually ventilate** - confirm high pressures and ensure adequate tidal volume
- Deepen anaesthesia.** If using **desflurane**, switch to alternative
- Emergency Drug therapy:**
  - Inhaled **salbutamol 12 puffs** via circuit (👤 <6yr = 6puffs; >6yr = 12puffs)
  - Inhaled **ipratromium bromide 6 puffs** via circuit (👤 4 puffs)
  - **IV salbutamol - 100-250mcg** slow bolus (👤 below). Can repeat at 10mins
  - **IV adrenaline - 0.1 - 0.5ml of 1:10,000** (👤 0.01-0.05ml/kg 1:10,000)
- Optimise ventilator** settings: pressure control mode, long expiratory phase, low respiratory rate, low PEEP, small tidal volumes, intermittent disconnection
- Other **bolus drug adjuncts:** **magnesium, ketamine, hydrocortisone aminophylline**
- If no improvement** use **infusions** of **salbutamol, adrenaline, aminophylline**
- Place arterial line. Take serial ABG's

- Always **consider other causes** of high airway pressure other than primary bronchospasm **tab 25d**  
Most common include:
  - anaphylaxis
  - tube position
  - pneumothorax
  - laryngospasm (on LMA)
  - chest wall rigidity
  - acute pulmonary oedema
- **Permissive hypercapnia** may be required in order to ↓ airway pressures
- Assess response by ↓ airway pressures, ABG's, and improving EtCO<sub>2</sub> trace

- **Salbutamol IV** slow bolus 👤: 10mcg/kg over 2 min (single dose max 500mcg). Can repeat at 10min
- **Magnesium:** 5ml of 49.3% over 20mins (👤 0.1ml/kg of 49.3% (max 5ml) in 50ml saline over 20mins)
- **Ketamine:** [must be anaesthetised] 35-70mg IV. (👤 0.5-2mg/kg)
- **Hydrocortisone:** 200mg IV (👤 4mg/Kg)
- **Aminophylline:** bolus load: 400mg over 15mins. Infuse: 50mg in 50ml at 35ml/hr. (👤 Load: 10mg/kg (max 500mg) over 1hr diluted to 50ml with saline. Infusion varies by age: **tab 36r**)
- **Salbutamol Infusion:** 5mg in 50ml saline. Infuse 0-10ml/hr. (👤 Infuse 5-10mcg/kg/min for 1 hour, then reduced to 1-2mcg/kg/min. <16kg: 3mg/kg made to 50ml with 5%dex. Then 1ml/hr = 1mcg/kg/min; >16kg: Use 20ml of 1mg/ml solution. Then ml/hr = 0.06 x kg x dose (mcg/kg/min).  
See [Starship clinical guidelines for infusion chart](#))
- **Adrenaline infusion:** 5mg in 50ml saline. Infuse 0-20ml/hr. (👤 not recommended)

5e

6e

## Main Priority: Minimise aspiration while maintaining SpO<sub>2</sub>

- Call for help from surgical team members immediately
- If practical, **move patient** to head down, **left lateral** position **asap**
- Remove LMA/OP airway & suction pharynx
- If time & SpO<sub>2</sub> stable >97%:**
  - Cricoid pressure (if not actively vomiting)
  - **Suxamethonium IV 100mg** 😊 IV 2mg/kg; IM 4mg/kg
  - **Intubate**
  - **Suction** through ETT with largest possible suction catheter
  - **Only** then, ventilate with 100% O<sub>2</sub>
- If SpO<sub>2</sub> dropping or <90%:**
  - **Do not delay oxygenation** regardless of particulates in pharynx/bronchial tree:
    - **Bag mask ventilation** with 100% O<sub>2</sub> **or**
    - Manual **breaths via ETT** with 100% O<sub>2</sub>
- Consider bronchoscopy
- Consider abandoning surgery
- Pass NG tube at earliest convenience

- Monitor patient for 2 hours post event in PACU: If they are asymptomatic, have normal vital signs and a normal CXR, then they are unlikely to require ICU
- **Steroids & antibiotics** are **not** routinely used medications in aspiration

- **Suxamethonium:** 😊: IV 2mg/kg; IM 4mg/kg



## Main priority = early defibrillation

- Ask surgeons to stop (if appropriate)
- Start chest compressions at **100/min** and monitor EtCO<sub>2</sub> (ensure full chest recoil)
- Attach defibrillator. **Shock immediately** at 200J (or max setting)
- 100% O<sub>2</sub>, stop anaesthetic agents**
- If holding a mask/LMA:** use ratio of **30** compressions : **2** breaths
- If ETT patent & secure:** ventilate at **10 breaths/min** & do **not** pause CPR
- Follow 2 min cycles:
  - Charge defib > Rhythm check > **shock** > restart compressions
  - **Adrenaline 1mg** (10ml of 1:10,000) immediately after 2nd shock, then every 4mins
  - **Amiodarone 300mg** immediately after 3rd shock
  - If ECG shows a QRS complex go to **tab 7e**
- Read out & consider reversible causes** (see below)
- Fetch ultrasound to help r/o causes (if skilled)
- If ROSC** consider post resuscitation care:
  - Abandon surgery (if possible), urgent cardiology referral (?for PCI)
  - ABCDE's, ABG's, 12 lead ECG
  - Avoid: SpO<sub>2</sub> >99%, hyperglycaemia (>10mmol/l), hypercarbia, >37.5° for 72hrs

### Reversible Causes:

- **Hypoxia**
- **Hypovolaemia or Haemorrhage**
- **Hypo/hyper-thermia**
- **Electrolyte/Metabolic Disturbance:**  
↑↓K, ↑↓Mg, ↓BSL, ↓pH, ↓↑Ca
- **Tension Pneumothorax**
- **Tamponade** - cardiac
- **Anaphylaxis & Toxins** - opioids, local anaesthetics, Ca channel or β blocker, other drug errors
- **Thrombosis** - cardiac or pulmonary
- **Pregnant** - manual uterine displacement & start preparations for delivering baby by 5mins **tab 19e**

### (Follow all drugs with 20ml flush)

- **Adrenaline** IV: 1mg (10ml of 1:10,000)
- **Amiodarone** IV: 300mg
- **Magnesium** IV: [Torsades]: 10mmol (5ml of 49.3%) over 2mins
- **Calcium Chloride** IV: [↑K or CCB overdose] 10ml of 10%
- **Sodium bicarbonate** 8.4% IV: [↑K or TCA OD or ↓pH] 50ml slow push. Can repeat every 2mins until pH 7.45-7.55
- **1% lignocaine** IV: [if **amiodarone** not available] 7ml bolus (0.1ml/kg). Can rpt every 10mins (max 0.3ml/kg)
- **Intralipid** 20% IV: [LA toxicity] Bolus: 100ml (1.5ml/kg); Infusion 1000ml/hr (15ml/kg/hr) **tab 15e**
- **Alteplase:** 50mg slow push. Can repeat at 15min (be prepared for prolonged CPR - up to 60 min)

Main priority = good quality CPR

- Ask surgeons to stop all vagal stimuli
- Start chest compressions at **100/min** and monitor EtCO<sub>2</sub> (ensure full chest recoil)
- Attach defibrillator**
- 100% O<sub>2</sub>, stop anaesthetic agents**
- If holding a mask/LMA:** use ratio of **30** compressions : **2** breaths
- If ETT patent & secure:** ventilate at **10 breaths/min** & do **not** pause CPR
- Follow 2 min cycles:
  - Charge defib > **rhythm & pulse check** > restart compressions
  - **Give adrenaline 1mg** (10ml of 1:10,000) **immediately**, then every 4min
  - If ECG shows VF/VT go to **tab 6e**
- In asystole: if **p waves** present consider **pacing** **tab 30d**
- Read out & consider reversible causes** (see below)
- Fetch ultrasound to help r/o causes (if skilled)
- If ROSC** consider post resuscitation care:
  - abandon surgery (if possible), urgent cardiology referral
  - ABCDE's, ABG's, 12 lead ECG
  - Avoid: SpO<sub>2</sub> >99%, hyperglycaemia (>10mmol/l), hypercarbia, >37.5° for 72hrs

*Reversible Causes:*

- **Hypoxia**
- **Hypovolaemia/Haemorrhage**
- **Hypo/hyper-thermia**
- **Electrolyte/Metabolic Disturbance:** ↑↓K, ↑↓Mg, ↓BSL, ↓pH, ↓↑Ca
- **Tension Pneumothorax**
- **Tamponade - cardiac**
- **Anaphylaxis & Toxins** - opioids, local anaesthetics, Ca channel or β blocker, other drug errors
- **Thrombosis** - cardiac or pulmonary
- **Pregnant** - manual uterine displacement & start preparations for delivering baby by 5mins **tab 19e**

(Follow all drugs with 20ml flush)

- [↑K Rx:]
  - **10ml 10% Ca chloride** slow push
  - **salbutamol:** 12puffs into circuit or 250mcg IV bolus
  - **10U actrapid in dextrose:** 50ml 50% dextrose (centrally); or 250ml 10% dextrose (peripherally), over 30min
- [Opiate toxicity] **Naloxone** = 400mcg
- [LA Toxicity]: **Intralipid** 20%: Bolus: 100ml (1.5ml/kg); Infusion 1000ml/hr (15ml/kg/hr) **tab 15e**
- [β blocker OD]: - **adrenaline infusion:** 5mg in 50mls saline. Infuse via CVL 0-20ml/hr
  - **isoprenaline:** Bolus = 200mcg amp into 20ml with saline & give 1ml boluses titrated. for infusion: **tab 35r**
  - **high dose insulin:** Bolus= 50ml of 50% **dextrose** & 70u **actrapid**. Infusion= 100u **actrapid** in 50ml saline, run at 35ml/hr & **10% dex** run at 250ml/hr (monitor BSL & K every 15-30min)
- [Thrombosis] **Alteplase:** 50mg slow push. Can repeat at 15min (be prepared for prolonged CPR - upto 60mins)

Main priority = Ensure adequate oxygenation & good CPR

- Ask surgeons to **stop all vagal stimuli**
- 100% O<sub>2</sub>, stop anaesthetic agents, give 2 breaths**
- Start chest compressions at **120/min** and monitor EtCO<sub>2</sub> (ensure full chest recoil)
- If holding a mask/LMA:** use ratio of **15 compressions : 2 breaths**
- If ETT patent & secure:** ventilate at **15 breath/min** & do **not** pause CPR
- Attach defibrillator
- Ensure IV access. If none establish **intraosseous access** (do not delay)
- Follow **2 min cycles:**
  - Charge defib 4J/kg > rhythm check +/- shock > restart compressions:
    - **If VF/VT** = **shock immediately** then every cycle.
      - Give **10mcg/kg adrenaline** straight after 2nd shock, then every 4 mins
      - Give **5mg/kg amiodarone** straight after 3rd shock
    - **If asystole/PEA** = give **10mcg/kg adrenaline ASAP** then every 4mins
- Atropine 20mcg/kg** is only used in vagal associated bradycardia
- Read out & consider reversible causes** (see below)
- Fetch ultrasound to help rule out causes (if skilled)
- If ROSC** consider post resuscitation care as **tab 7e**

## Reversible Causes: (most common in bold)

- **Hypoxia & Vagal Tone**
- **Hypovolaemia/Haemorrhage/Anaphylaxis**
- **Hypo/hyper-thermia**
- **Electrolyte/Metabolic Disturbance:** ↑↓K, ↑↓Mg, ↓BSL, ↓pH, ↓↑Ca
- **Tension Pneumothorax**
- **Tamponade** - cardiac
- **Anaphylaxis & Toxins** - opioids, local anaesthetics, Ca channel or β blocker, other drug errors
- **Thrombosis** - cardiac or pulmonary

## Paeds Calculations (Follow all drugs with 20ml flush)

- **Weight:** age <1yr = (months/2)+4; age 1-5 = (yrs x2)+8; age 6-12 = (yrs x3)+7
- **Energy (J):** 4\*Kg; if using AED - use attenuated paed pads for <8yrs old (if available)
- **Tube (uncuffed):** preterm (<1.5kg) = 2.5; preterm (1.5-3kg) = 3; <1yr = 3.5 - 4; >1yr = (age/4) + 4
- **Fluid:** 20ml/kg bolus
- **Adrenaline:** IV = 10mcg/kg (0.1ml/kg of 1:10,000); ETT = 100mcg/kg (0.1ml/kg of 1:1,000)
- **Amiodarone:** 5mg/kg
- **Atropine:** 20mcg/kg IV or IM
- **Glucose:** 2ml/kg of 10% dextrose
- **Sux:** IV: 2mg/kg; IM: 4mg/kg
- **Calcium chloride 10%:** 0.1-0.2ml/kg
- **Naloxone:** 10mcg/kg

# 9e. PAEDIATRIC EMERGENCY CALCULATIONS

- Follow all drugs with an appropriate large flush
- ETT sizes are uncuffed tubes. Consider dropping 0.5-1mm in size for cuffed tubes
- Calculations have been rounded where relevant & insignificant

2 months or 5 kg		6 months or 7 kg		1yr or 10 kg	
Normal HR	100-160	Normal HR	100-160	Normal HR	90-140
Energy (J)	20	Energy (J)	28	Energy (J)	40
ETT Size (mm)	3.5	ETT Size (mm)	3.5-4	ETT Size (mm)	4
ETT (oral) Length (cm)	10	ETT (oral) Length (cm)	10.5	ETT (oral) Length (cm)	11
ETT (nasal) Length (cm)	12	ETT (nasal) Length (cm)	12	ETT (nasal) Length (cm)	14
LMA Size	1.5	LMA Size	1.5	LMA Size	2
Fluid bolus (ml)	100	Fluid bolus (ml)	140	Fluid bolus (ml)	200
Adrenaline (1:10,000)	0.5ml	Adrenaline (1:10,000)	0.7ml	Adrenaline (1:10,000)	1ml
Amiodarone (mg)	25	Amiodarone (mg)	35	Amiodarone (mg)	50
10% Glucose (ml)	10	10% Glucose (ml)	14	10% Glucose (ml)	20
Sux - IV (mg)	10	Sux - IV (mg)	14	Sux - IV (mg)	20
Sux - IM (mg)	20	Sux - IM (mg)	28	Sux - IM (mg)	40
Atropine (mcg)	100	Atropine (mcg)	140	Atropine (mcg)	200

3yr or 14kg		5yr or 18kg		10yr or 37kg	
Normal HR	90-140	Normal HR	80-130	Normal HR	80-130
Energy (J)	55	Energy (J)	70	Energy (J)	150
ETT Size (mm)	4.5	ETT Size (mm)	5.5	ETT Size (mm)	6.5
ETT (oral) Length (cm)	13	ETT (oral) Length (cm)	15	ETT (oral) Length (cm)	17
ETT (nasal) Length (cm)	16	ETT (nasal) Length (cm)	19	ETT (nasal) Length (cm)	21
LMA Size	2	LMA Size	2	LMA Size	3
Fluid bolus (ml)	280	Fluid bolus (ml)	360	Fluid bolus (ml)	740
Adrenaline (1:10,000)	1.4ml	Adrenaline (1:10,000)	1.8ml	Adrenaline (1:10,000)	3.7ml
Amiodarone (mg)	70	Amiodarone (mg)	90	Amiodarone (mg)	185
10% Glucose (ml)	30	10% Glucose (ml)	35	10% Glucose (ml)	75
Sux - IV (mg)	30	Sux - IV (mg)	35	Sux - IV (mg)	75
Sux - IM (mg)	55	Sux - IM (mg)	72	Sux - IM (mg)	150
Atropine (mcg)	280	Atropine (mcg)	360	Atropine (mcg)	600

9e  
10e

# 10e. ANAPHYLAXIS

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Emerg | Diag

Main priority = **Cease triggers, give adrenaline & IV fluid**

- Get **anaphylaxis box** (if you prefer: follow ANZAAG task cards)
- Stop** or remove **causative agents** (eg drugs, blood products, latex products, chlorhexidine etc)
- Consider early intubation (risk of airway oedema)
- Ensure large bore IV access. If none, consider intraosseous access
- Treat based on grade of anaphylaxis** (see yellow box)

▶ Give **IV adrenaline & fluids asap**

(If no IV: Give **IM adrenaline 0.5ml 1:1,000** (👉 1:1,000 <sup><6yrs = 0.15ml</sup> <sub>6-12yrs = 0.3ml</sub>) . Repeat every 5mins)

▶ Repeat **adrenaline** & fluid boluses every 1-2 minutes as required:

	Grade 1 (Mild)	Grade 2 (Mod/severe)	Grade 3 (Life threatening)	Grade 4 = CPR (PEA Cardiac arrest or adult SBP <50mmHg)
<b>IV Adrenaline</b>	N/A	<b>10-20mcg</b> (0.1-0.2ml 1:10,000) [👉 Dilute 1mg in 50ml =20mcg/ml Give 0.1ml/kg =2mcg/kg]	<b>50-100mcg</b> (0.5-1ml 1:10,000) [👉 Dilute 1mg in 50ml =20mcg/ml Give 0.2-0.5ml/kg =4-10mcg/kg]	<b>1mg</b> (10ml 1:10,000) [👉 0.1ml/kg 1:10,000 = 10mcg/kg]
<b>Fluid Bolus</b>	N/A	Rapid 500ml [👉 20ml/kg]	Rapid 1 litre [👉 20ml/kg]	Rapid 2 litres [👉 20ml/kg]
<b>Legs</b>	N/A	Elevate	Elevate	Elevate

▶ If >3 **adrenaline** boluses start **adrenaline infusion**

**Refractory management:**

▶ **bronchospasm** ( **tab 4** for other drug options)

- **Salbutamol**: 12 puffs (👉 = <sup><6yrs = 6 puffs</sup> <sub>>6yrs = 12 puffs</sub>) ⇒ IV bolus (see below) ⇒ infusion (see below)

▶ **hypotension:**

- **adrenaline infusion** ⇒ **repeat fluid bolus** ⇒ **noradrenaline +/- vasopressin**

- Monitor treatment success: MAP, SpO<sub>2</sub>, airway pressures, EtCO<sub>2</sub> waveform, ECHO
- Place arterial line
- Consider abandoning surgery (or expedite finish)
- Once stabilised: dexamethasone 12mg** (👉 = 0.6mg/kg)

• **Grades of anaphylaxis:**

Grade 1 = Mild	Grade 2 = Mod/severe	Grade 3 = Life threatening	Grade 4 = Cardiac arrest
Mucocutaneous signs	Mucocutaneous signs	+/- Mucocutaneous signs	PEA cardiac arrest
+/- Angiooedema	↓MAP, ↑HR	Arrhythmias & CVS collapse	Adult SBP <50mmHg
	Bronchospasm	Severe bronchospasm	Absent EtCO <sub>2</sub>

- **Consider differential** eg tension pneumothorax **tab 32d**, auto-PEEP **tab 25d**, oesophageal intubation
- Collect **tryptase** (yellow tube) levels **ASAP** and at time **1, 4 and 24hrs**

- **Adrenaline** or **Noradrenaline** infusion (do not need CVL to start) : 3mg in 50ml saline. Infuse 3-40ml/hr (👉 0.15mg/kg made to 50ml with saline. Infuse 1-40ml/hr)
- **Salbutamol** IV bolus: 100- 250mcg (👉 <2yrs = 5mcg/kg; 2-18yrs = 15mcg/kg (max 250mcg)  
infusion: 5mg in 50ml saline. Infuse 1-10ml/hr (👉 5mcg/kg/min for 1hr then 1-2mcg/kg/min)
- **Vasopressin** (do not need CVL to start) : 20units in 20ml saline. Bolus 1ml. Infuse 1-4ml/hr (👉 1unit/kg made to 50ml with saline. Bolus 2 ml. Infuse 1-3ml/hr)

9e

10e

Main priority = ↓ Myocardial O<sub>2</sub> consumption & ↑ myocardial O<sub>2</sub> supply

- Titrated inspired O<sub>2</sub> to **normal** SpO<sub>2</sub> 97-99% (PaO<sub>2</sub> 80-100mmHg)
- Check **depth** of anaesthesia, ensure adequate **analgesia**
- Control heart rate** (target 60-80bpm):
  - Minimise surgical stimulation (where appropriate)
  - Drug strategies:
    - **Esmolol 20mg** boluses titrated to effect
    - **Metoprolol 2.5mg** boluses titrated to effect (max 15mg)
- Target MAP of 65-75mmHg:**
  - If MAP <65mmHg:
    - Use **vasopressors or ephedrine** cautiously
    - If refractory ↓MAP consider:
      - Drugs: inotrope (eg **dobutamine**) or inodilators (eg **milrinone**)
      - Cardiothoracic referral for placement of Intra-Aortic Balloon Pump
  - If MAP >75mmHg: use **GTN infusion**
- Avoid hypovolaemia** - replace surgical losses & **transfuse** to Hb 80-90
- If **ongoing** signs of **ischaemia** commence **GTN infusion** regardless of MAP & support MAP with drugs/Intra-Aortic Balloon Pump as required
- Expedite end of surgery

## Other Intra-Op Tasks to consider:

- Discuss anticoagulation with surgeon: heparin +/- aspirin, clopidogrel, enoxaparin
- ECHO to assess myocardial performance/volume status
- Further haemodynamic monitoring eg Cardiac Index Monitoring
- Take baseline Troponin, then at 3hrs or 6 hrs

## Post Op Tasks to consider:

- 12 lead ECG and ongoing post-op telemetry
- Immediate cardiology referral - ?suitability for PCI

- Vasopressors - **Phenylephrine**: 50mcg bolus, **Metaraminol**: 0.5mg bolus
- **Ephedrine**: 6mg bolus. Titrate
- **Noradrenaline**: 5mg in 50ml saline. Infuse 0-20ml/hr preferably via CVL
- **Adrenaline**: 5mg in 50ml saline. Infuse 0-20ml/hr preferably via CVL
- **Dobutamine**: 250mg in 50ml saline. Infuse 0-10ml/hr (can infuse peripherally)
- **Milrinone**: 10mg in 50ml saline. Infuse at 5ml/hr or 10ml/hr only
- **GTN**: 50mg in 50ml saline. Infuse at 1-12ml/hr titrated to MAP & ECG changes

11e

12e

# 12e. MASSIVE HAEMORRHAGE

Contents  
Emerg | Diag

Main priority = Volume replacement & good teamwork

- IV access:** x2 16G cannula +/- Rapid Infusion Catheter (RIC) (👉 largest IV & remove extension)
- Talk to surgeon: All efforts to get **surgical control of bleeding?**  
(compression, packing, direct pressure, arterial/aortic clamping)
- Give **tranexamic Acid: 1g** (standard & obstetric) Or **2g** (trauma)
- Call blood bank: 6961** "I am requesting (Crimson, Standard or Obstetric) Stat Pack"
- If ongoing massive bleeding + shock:**
  - Call blood bank "I am **activating** (Crimson, Standard or Obstetric) **MHP**"  
(👉 follow [Starship paediatric MHP protocol](#))
  - **Assemble a team with clear roles** (transfusion coordinator, MHP runner, blood checkers, people to hang blood etc..)
  - With all MHP packs, give **IV calcium chloride 10ml** via fast & different IV
- Set up rapid infusion device (+/- cell saver)
- Insert arterial line
- Use **permissive hypotension:** MAP 55-65mmHg until haemostasis established  
(except head injuries where MAP target = 80-90mmHg)
- Aggressively keep **warm** (>36°C): Warm fluids, warm theatre, forced air warmer
- Check bloods every 30mins:** Coags (TEG if available), FBC, ABG, iCa<sup>2+</sup>
- Stand down MHP** once clinically stable. Change to targeted transfusion (see green box)

11e

12e

- For code Crimson (trauma) use ABC score  $\geq 2$  as threshold for calling for stat pack:
  - 1 point for any of: - Penetrating mechanism; - SBP  $\leq 90$ mmHg; - Positive eFAST; - HR  $\geq 120$ bpm
- Smaller centres should only give platelets if FBC = platelets  $< 75 \times 10^9/L$
- Platelets: new infusion set preferred, but not essential
- Calcium chloride: Do not administer in same giving set as blood products  
Ensure peripheral IV patent working and crystalloid running quickly

## • Targeted Transfusion Thresholds & Doses:

- **INR**  $> 1.5$  or APTT  $> 40$  = 4U **FFP** (👉 20ml/kg)
- **Fibrinogen**  $< 2G/L$  = 3U **cryoprecipitate** (👉 5ml/kg)
- **Platelets**  $< 75$  = 1 adult pack of platelets (👉 10ml/kg)
- **iCa**  $< 1.1$ mmol/l = 10ml calcium chloride (👉 0.1ml/kg)
- **Factor VIIa** in consultation with haematologist - 6mg (90mcg/kg)

## • Blood product compatibility:

- Rbc's:  
(in a crisis, Rh is not impt - see blood bank)

Patient (Recipient)	Compatible (Donor)
A	A, O
B	B, O
AB	A, B, AB, O
O	O

- FFP:  
(at any time, Rh is not relevant)

Patient (Recipient)	Compatible (Donor)
A	A, AB
B	B, AB
AB	AB
O	O, A, B, AB

- Platelets/Cryo:

- in a crisis, ABO & Rh are not impt (see blood bank)

## Main priority = Restore cardio-respiratory stability

- 100% oxygen
- Stop nitrous oxide**
- Stop source** of air/gas entry:
  - Surgical site - lower to below level of heart & flood with irrigation fluid
  - Entry point - search for e.g. open venous line
  - Neurosurgery case - consider intermittent jugular venous compression
- Place **patient in head down, left tilt** position
- Remove pneumoperitoneum** (if in use)
- If CVL in place - aspirate line
- Consider **chest compressions** 100/min (even if not in arrest - known to break up volumes of air)
- Aim MAP >65mmHg** :
  - Assess fluid responsiveness - 500ml bolus crystalloid (👉 = 20ml/kg)
  - Vasoactive medications eg **noradrenaline, adrenaline, dobutamine**
- Consider early TOE - (useful to r/o other causes of pulmonary embolism)
- Consider appropriateness of bypass and a referral for ECMO

### • Signs of air/gas embolism:

- **Respiratory:** ↓EtCO<sub>2</sub> (most sensitive), ↓SpO<sub>2</sub>, pulmonary oedema, bronchospasm
- **CVS:** shock, tachycardia, ↑PA pressures, cardiovascular collapse
- Use of **PEEP** is controversial. May ↑risk of paradoxical air embolism through PFO (note PFO is present in 10-30% of population)
- **Hyperbaric O<sub>2</sub>** - treatment up to 6hrs post event may improve outcome in paradoxical air embolism

### • Adrenaline:

- bolus = 10-100mcg (0.1-1ml of 1:10,000) - (👉 0.01-0.05ml/kg of 1:10,000)
- Infusion = 5mg in 50ml saline. Infuse 0-20ml/hr (👉 **tab 36r**)
- **Noradrenaline infusion:** 5mg in 50ml saline. Infuse 0-20ml/hr
- **Dobutamine infusion:** 250mg in 50ml saline. Infuse 0-10ml/hr (can infuse peripherally)



Main priority = **Early recognition & resuscitation of ABC's**

- Stop transfusion**, discard giving set & flush line
- Recheck blood against patient
- Minimise volatile/TIVA but maintain anaesthesia
- Resuscitate based on ABC's:**
  - Consider early intubation
  - Treat bronchospasm if present **tab 4e**
  - Address cardiovascular instability - aim MAP >65mmHg:
    - Assess fluid responsiveness: Leg elevation +/- 500ml fluid bolus (👉 20ml/kg)
    - Start **adrenaline infusion** (recommended 1st line due to diagnostic similarity with anaphylaxis)
    - Maintain urine output (aim 1ml/kg/hr) - **IV furosemide 35mg**
- Place arterial line, CVL & urinary catheter (collect urine for analysis)
- Take bloods: U&E, FBC, Coags & sample for re-X match
- Watch for **coagulopathy** & consult haematologist - Treat early **tab 12e**
- Consider **IV methylprednisolone 250mg** slow injection
- Collate all blood products** & return to lab
- Contact ICU

- **Signs of haemolytic transfusion reaction** (very similar to anaphylaxis):
  - **CVS:** shock, tachycardia/arrhythmias, cardiac arrest
  - **Respiratory:** Bronchospasm, wheezing, Cough/Stridor, Hypoxia, ↑ airway pressure
  - **Misc:** urticaria, oedema, bleeding from wound sites/membranes, dark coloured urine
- **Consider differential** eg anaphylaxis **tab 10e** , cardiogenic shock **tab 11e** , etc..
- If relevant consult protocols for
  - Anaphylaxis - **tab 10e**
  - Bronchospasm - **tab 4e**
  - Severe Intraoperative haemorrhage - **tab 12e**

- **Adrenaline** or **Noradrenaline** infusion: 5mg in 50ml saline. Infuse 0-20ml/hr
- **Salbutamol:**
  - bolus = 250mcg slow push (👉 <2yrs = 5mcg/kg; <18yrs 15mcg/kg (max 250mcg)
  - infusion = 5mg in 50ml saline. Infuse 0-10ml/hr (👉 50ml of neat salbutamol. Infuse 5-10mcg/kg/min for 1 hour, then reduced to 1-2mcg/kg/min)

# 15e. LOCAL ANAESTHETIC TOXICITY

Contents  
Emerg | Diag

Main Priority: **Good Quality CPR & early Intralipid**

**Stop** administration of **LA** and get **LA Toxicity Box** (if you prefer: follow AAGBI task cards)

**If signs of cardiac output:**

- ▶ Confirm IV access
- ▶ Consider need for **intubation**
- ▶ **Ventilate** if required - aim for EtCO<sub>2</sub> 30mmHg
- ▶ Consider giving **IV 20% intralipid** early: bolus then infusion (see dosing below)
- ▶ If **arrhythmia** use standard protocols **tab 29d**  
(Consider **amiodarone 300mg** slow IV push. Avoid **lignocaine**, caution with **B blockers**)
- ▶ Support **MAP** with fluids & **vasopressors**
- ▶ Treat **seizures**:
  - **midazolam IV 2mg** bolus. Repeat every min (max 10mg) (👉 see green box)
  - If **refractory**: perform **RSI**

**If cardiac arrest:**

- ▶ Start **CPR** (**tab 6e** or **tab 7e**). Be prepared to continue for 60 min.
- ▶ Give **20% IV intralipid** (👉 see green box) :
  - **Bolus**: 100ml. Can repeat every 5 mins, maximum twice (if required)
  - **Infusion**: 1000ml/hr neat intralipid. Double rate @ 5 min if no improvement
  - Do not exceed max dose of 840ml (12ml/kg)
- ▶ Mobilise cardiopulmonary bypass/ECMO team (if available)
- ▶ Send **ABG** - keep pH >7.25: Give **sodium bicarbonate 8.4% 50ml** (👉 1ml/kg)  
(Can repeat every 2 min - must ensure adequate ventilation)

- **Signs** of LA toxicity:
  - ▶ **CNS**: Numb tongue, tinnitus, metallic taste, slurred speech, seizures, unconscious
  - ▶ **CVS**: ↓MAP, broad QRS, bradycardia deteriorating into PEA & asystole
- Temporary pacing may be required for symptomatic bradycardias **tab 30d**

**PAEDS Dosing** (**tab 8e** or **tab 36r** for 👉 resus doses)

- **Midazolam**: IV 0.1mg/kg; IM 0.2mg/kg; buccal 0.5mg/kg. Can repeat at 5min
- **Intralipid 20%**: bolus: 1.5ml/kg. Can rpt every 5mins x2. Infusion: 15ml/kg/hr. At 5min can double rate if no improvement. Max cumulative dose = 12ml/kg

15e

16e

# 16e. MALIGNANT HYPERTHERMIA

Contents  
Emerg | Diag

Main Priority: **Early Recognition, Removal of Triggers, Dantrolene**

- Recognise problem** (see yellow box) - if in doubt, treat
- Call for **MH trolley** (if you prefer: distribute & follow MH task cards)
- Delegate & organise help into teams
- Stop volatile**, washout with **100% oxygen at 15 L/min**. Switch to **TIVA**.
- Add charcoal filters to circuit. Change soda lime if easy (**Do not** waste time changing machine/circuit)
- Give **IV dantrolene** (☹️ 2.5mg/kg), **source more** from on call pharmacist:
  - 9 vials of 20mg. Reconstitute each vial into 60ml syringe with sterile water
  - Repeat every 10min until control achieved (improving temp/CO<sub>2</sub>/pH, to a max 10mg/kg)
- Increase **monitoring** if not already in place:
  - **Arterial line** +/- CVL. Take serial bloods: ABGs (every 30min), Coags, CK
  - **Urinary catheter**. Aim for urine output >2ml/kg/hr
  - **Core temperature probe** eg rectal or bladder
- Treat complications:**
  - **>38.5°C**: refrigerated IV fluids (& intraperitoneal if surgical access), surface ice, cold operating room
  - **pH <7.2**: Ventilate EtCO<sub>2</sub> to 30mmHg (+/- **sodium bicarbonate**)
  - **K<sup>+</sup> >7** or **ECG changes**: Give **IV calcium chloride**, **IV insulin-dextrose infusion**, **salbutamol puffs**
  - **Arrhythmias**: Defibrillate. Consider **IV amiodarone** +/- **lignocaine** +/- **esmolol**
  - **MAP <65mmHg**: start **noradrenaline** infusion
- Consider abandoning surgery & ICU referral

• Rapid diagnosis: ABG = mixed respiratory & metabolic acidosis

• **Signs** suggesting possible MH:

Early	Developing	Late
↑ing EtCO <sub>2</sub>	↑ing temp/sweating	Cola coloured urine
Masseter spasm	CVS instability	Coagulopathy, ↑↑CK
↑HR/arrhythmia	↓pH, ↑K	Cardiac arrest

- [**pH<7.2**]: **Sodium bicarbonate** 8.4% 50ml (☹️ 1ml/kg), repeat every 2mins
- [**K<sup>+</sup> >7**]: **Calcium chloride** 10% 10ml IV (☹️ 0.2ml/kg); 10units of **actrapid** in 250ml **10% dextrose** over 30mins (☹️ 0.1u/kg actrapid in 5ml/kg of 10% dextrose over 30mins); 12puffs **salbutamol** into circuit (☹️ 2-6puffs) repeat every 20mins
- [**arrhythmias**]: **Amiodarone** 300mg slow IV push (☹️ 5mg/kg); 7ml **1% lignocaine** slow IV push (☹️ 0.1-0.2ml/kg) (Can repeat every 10 mins - max 0.3ml/kg); **Esmolol** 10mg increments
- [**↓MAP**]: **Noradrenaline** infusion: 5mg in 50ml saline. Infuse at 0-20ml/hr

15e

16e

# 17e. HYPERKALAEMIA

Contents  
Emerg | Diag

## Main Priority: Monitor ECG & Treat

- Consider haemolysis or faulty sample & need to re-check
- Stop any source of K<sup>+</sup> infusion.** Re-check recent drug calculations
- ↑ Minute ventilation.** Aim for EtCO<sub>2</sub> of 30mmHg
- If K<sup>+</sup> >6.5mmol/L +/- marked ECG changes** start drug therapy (🧐 see green box):
  - **10% calcium chloride 10ml slow bolus**
  - Infuse quickly: **0.1ml of undiluted actrapid (10 units) in 250ml 10% dextrose**
  - **100-250mcg IV salbutamol** (or 12puffs via circuit/5mg neb) Repeat every 20mins
- **If refractory high K<sup>+</sup> consider** (🧐 see green box):
  - **50ml 8.4% sodium bicarbonate** (ensure adequate ventilation)
  - **20-40mg IV frusemide**
  - Referral for dialysis
- Correct any reversible precipitating factors

- **ECG signs** of hyperkalaemia:
  - peaked T waves
  - prolonged PR
  - wide QRS
  - loss of P waves
  - ↓ R amplitude
  - asystole
- **Precipitating factors** to consider:
  - trauma
  - burns
  - suxamethonium use in burns, spinal injury, neurological disease
  - MH
  - rhabdomyolysis
  - acidosis
  - acute renal failure
  - organ re-perfusion eg following clamp/tourniquet
  - haemolysis/massive transfusion
  - medications
- **Avoid:**
  - further doses of suxamethonium
  - respiratory acidosis

### 🧐 PAEDS Doses

- **Calcium chloride** 10% 0.2ml/kg slow bolus
- **Insulin/dextrose:**
  - Periph IV: Bolus 0.1u/kg actrapid in 5ml/kg of 10% dextrose
  - Central Line: Bolus 0.1u/kg actrapid in 2ml/kg of 50% dextrose
- **Salbutamol:** <5yrs: 6puffs every 20mins; >5yrs: 6-12puffs every 20mins
- **Sodium bicarbonate** 8.4%: 1ml/kg slow push. Can repeat every 2mins
- **Frusemide:** 1mg/kg IV bolus

17e

18e

## AIRWAY FIRE

**Main priority = Disconnect circuit & flood with saline**

- Stop ignition source** - laser or diathermy
- Turn off oxygen & disconnect breathing circuit** from airway device
- Extinguish fire:**
  - Flood fire with **saline: 50ml** into mouth, **10-20ml** down ETT (😊 1ml/kg max 20ml)
  - **CO<sub>2</sub> extinguisher** (safe to use in airway)
- Remove airway device** & keep for inspection  
(only consider leaving ETT in place if difficult intubation & **very** low risk of fire extending into ETT)
- Remove any **flammable material** in mouth - packs, gauze & sponges
- Retrieve debris** with a Yankauer sucker or large bore suction catheter
- Convert to **TIVA anaesthetic**
- Restart ventilation only when fire is fully extinguished (wait 1-3min if SpO<sub>2</sub> allows):
  - Use bag mask ventilation initially but prepare for early intubation
  - Use **lowest possible oxygen** to maintain normal SpO<sub>2</sub>
- If unable to re-intubate:** perform **infraglottic technique** depending on urgency:
  - emergency: infraglottic technique **tab 2e**
  - urgent: call ENT to perform tracheostomy
- Terminate** or **expedite** end of surgery
- Post crisis care:
  - Perform **bronchoscopic exam** to assess mucosal airway damage
  - **Do not extubate**; refer to ICU

## PATIENT FIRE

**Main priority = Recognise fire and extinguish**

- Stop** any flow of **oxygen** or **nitrous** near/into to fire
- Remove **all drapes** and flammable material from patient
- Extinguish fire with:
  - **Saline, fire blanket** or **CO<sub>2</sub> extinguisher** (safe in wounds & electrical equipment)
  - **Do not** use alcohol liquids
  - **Do not** use any liquid on/around electrical equipment
- If fire persists:** activate fire alarm, turn off gas supply to room, evacuate

- To **decrease risk of airway fire:**
  - Use lowest possible oxygen, avoid nitrous
  - Place saline in ETT & LMA cuffs
  - Pack wet throat pack around ETT's
  - If LASER surgery: use LASER resistant ETT with methylene blue in proximal cuff, saline in distal cuff

- To **decrease risk of patient fire:**
  - Allow time for skin preps to fully dry
  - Use moistened sponges & gauzes near ignition sources


## Main Priority: Good CPR, Diagnose Cause, Prepare for Delivery

- Review all infusions/medications recently administered
- Consider haemorrhage (?concealed) **tab 12e**. Call blood bank for “Obstetric Stat Pack”
- If no cardiac output:**
  - Call 777 & declare ‘**maternal cardiac arrest**’
  - Start **preparations** to deliver baby **now** (peri-mortem Caesarean or instrumental)
  - Remove all foetal monitoring
  - Start **CPR** > apply **defib** > check **rhythm** > **tab 6e** or **tab 7e**
  - Ensure IV access, if none consider IO access
  - Consider reversible causes & **attempt diagnosis & treat asap** (see yellow box)
- Note ‘**maternal**’ **specific tasks** during CPR:
  - **Lift uterus skyward & displace** to left
  - **Intubate early** & ventilate with EtCO<sub>2</sub> target of 30mmHg
  - Perform chest **compressions higher** on chest & push **deeper**
  - Patient >24 weeks: If **no rapid ROSC** then start **immediate** preparations to **deliver baby** within 5mins (peri-mortem Caesarean or instrumental)
- if Peri or Post Arrest:**
  - Start standard peri-arrest care. Supporting **ABC’s as appropriate** (intubate early)
  - Consider reversible causes & **attempt diagnosis & treat asap** (see yellow box)
  - Ensure ongoing **lifting of uterus** skyward & displaced to left (if baby not delivered)

- **Delivery of baby** is performed to **improve maternal prognosis, not babies**
- Consider the reversible causes of collapse in pregnancy (**Ts & Hs**):
  - **Hypoxia:** aspiration, high spinal
  - **Hypovolaemia/hypotension:** bleeding, high spinal
  - **Metabolic disorders:** AKI from severe pre-eclampsia, ↓BSL
  - **Hypertension:** intracranial haemorrhage, eclamptic seizure
  - **Toxicity:** Anaphylaxis, ↑Mg<sup>2+</sup>, LA toxicity
  - **Thromboembolism:** VTE/PE, amniotic fluid or air embolism
  - **Tamponade:** cardiac 2nd to aortic dissection, trauma
  - **Tension Pneumothorax:** trauma

- **Magnesium (49.3%)** [eclampsia]:
  - loading infusion: 8ml in 12ml saline. Infuse at 120ml/hr
  - For maintenance & rescue doses **tab 23e**
- **Calcium chloride 10%** [MgSO<sub>4</sub> toxicity antidote]: 5ml slow push. (can repeat)
- **20% Intralipid** [LA toxicity]: (max total 12ml/kg)
  - bolus: 100ml (1.5ml/kg). Repeat (max twice) every 5 mins, if required
  - maintenance: 1000ml/hr (15ml/kg/hr). Double speed @5mins if no improvement
- **Alteplase** [Thrombosis]: Arrest = 50mg slow push. Can repeat at 15min (continue CPR for upto 60mins)  
 Peri-Arrest = 20mg slow push. Then 80mg in 20ml saline. Infuse at 10ml/hr  
 [To reverse]: Stop infusion. Give **1g tranexamic acid**. Call haematologist (**cryo +/- platelets**)

## Main Priority: Dry baby, Oxygenate & Reassess every 30secs

- Pre-setup **neopuff**: Gas supply @10L, PEEP 5, PIP 30cmH<sub>2</sub>O. Heater & suction
- In 1st minute: **Vigorously dry** baby & apply warm, dry towels
- Then work in **30 sec cycles**. Perform intervention then reassess at end of cycle:
  - **Tone** - UL & LL
  - **HR** - use SpO<sub>2</sub> probe or stethoscope (tap beats out +/- count beats for 3secs, then x 20)
  - **RR** - Are they gasping or apnoeic?
- If HR >100, good tone, regular RR:** give routine care
- If baby well except ↑WOB:** open airway & give 5 cmH<sub>2</sub>O CPAP with room air
- If any of HR <100, poor tone, gasping/apnoeic:** start ventilating (with EtCO<sub>2</sub>):
  - Fine tuning of neutral head position with jaw thrust is vital
  - Room air initially. ↑O<sub>2</sub> every 30 secs if no improvement: 40->60->80->100%
  - Give x5 inflation breaths of 2-3 sec: PIP 30cmH<sub>2</sub>O
  - Once adequate **chest rise**: RR 40-60/min: PIP 15-20cmH<sub>2</sub>O
- If HR <60:**
  - 100% O<sub>2</sub>. Consider LMA or intubation (if skilled)
  - Start chest compressions 100/min (2 thumb technique with 2nd person for airway is preferred)
  - Use ratio = **compressions 3 : 1 breath** (half second compression pause to deliver breath)
- If Ongoing HR <60:**
  - Give **1:10,000 adrenaline** based on gestation
  - Umbilical **venous catheter** is preferred (1 vein, 2 arteries) 

	23-26 Weeks	27-37 Weeks	38-43 Weeks
<b>Umbilical Adrenaline</b>	0.1 ml	0.25 ml	0.5 ml
<b>ETT Adrenaline</b>	1ml/kg (100mcg/kg)		

  - Consider **umbilical saline bolus** 10ml/kg

- If **preterm** use lower inflation pressures: 28-32wks = 25/5; <28wks = 20/5
- Significant **meconium** delivery: Only suction a flat baby with no resp effort prior to oxygenating
- Place NG to **decompress stomach** if difficulty ventilating
- Assistant can place SpO<sub>2</sub> probe on right hand at any point. **Targets:**
  - 1min = 60-70%    ▸ 3min = 70-90%    ▸ 5min = 80-90%
  - 2min = 65-85%    ▸ 4min = 75-90%    ▸ 10min = 85-90%

## Neonatal Drugs & Equipment tab 9e

- **Naloxone**: Full term = 200mcg IM (otherwise 10mcg/kg IM/IV)
- **ETT**: uncuffed size = [term] 3-3.5mm, [preterm] 2.5mm; length @lips [term] 9cm, [preterm] 7cm

## Main Priority: Rapid management of ABC's

- If on delivery suite:** Call 777 & declare “**obstetric & neonatal emergency**”
- Review all infusions/medications & consider reversible causes (yellow box below)
- If no cardiac output:**
  - ▶ Start CPR > apply **defib** > check rhythm **tab 6e** or **tab 7e**
  - ▶ If obstetrics, follow ‘**maternal**’ **specific tasks**:
    - Lift uterus skyward & displace to left
    - **Intubate early** & ventilate with EtCO<sub>2</sub> target of 30mmHg
    - Perform chest **compressions higher** on chest & **push deeper**
    - Patient >24 weeks: If **no rapid ROSC** then start **immediate** preparations to **deliver baby** within 5mins (peri-mortem Caesarean or instrumental)
  - ▶ Note ‘**total spinal**’ **specific tasks**:
    - Give **adrenaline 1mg asap** (10ml 1:10,000) (☹️ 10mcg/kg)
    - Early rapid infusion of 2-3 litres of **fluid** (☹️ 20ml/kg)
- If respiratory arrest or distress or falling SpO<sub>2</sub>:**
  - ▶ Elevate head of bed to 30 degrees
  - ▶ Assist ventilation with 100% O<sub>2</sub> via BMV while **preparing to RSI**
  - ▶ Consider induction with **midazolam 5-10mg, alfentanil 1mg, sux 100mg**
- If cardiovascularly unstable (↓HR & ↓MAP):**
  - ▶ **Elevate** legs, rapidly infuse 2-3 litres fluid (☹️ 20ml/kg)
  - ▶ If obstetrics, **lift uterus** skyward & displace to left
  - ▶ If **HR <60** then give **600mcg atropine** (☹️ 20mcg/kg). Repeat if required (max adult 3mg)
  - ▶ Give **vasopressor** (see below) depending on **HR**. Repeat as required.
  - ▶ Refractory ↓MAP: use **adrenaline boluses +/- infusion**

- Diagnosis is clear if witnessed rapidly ascending block following neuraxial procedure
- If unwitnessed collapse consider **other causes** (if obstetrics **tab 19e**):
  - ▶ Vasovagal
  - ▶ Haemorrhage (external or concealed) **tab 12e** / **tab 22e**
  - ▶ LA Toxicity **tab 15e**
  - ▶ Amniotic Fluid Embolism **tab 24e**
  - ▶ Mg toxicity
  - ▶ IVC compression
  - ▶ Massive pulmonary embolus
  - ▶ Drug error

- **Vasopressor: phenylephrine** 100mcg (☹️ 10mcg/kg); **metaraminol** 1mg (☹️ 10mcg/kg); **ephedrine** 9mg (☹️ 0.1mg/kg)
- **Adrenaline** - bolus: 0.1-0.5ml 1:10,000 (10-50mcg); infusion: 5mg in 50ml saline. Infuse at 0-20ml/hr (☹️ infusion only: 0.15mg/kg (max 5mg) in 50ml saline. Infuse 0.5-10ml/hr)



## Main Priority: Prepare for Massive, Rapid Blood Loss

- x2 16G IV** cannula - consider intraosseous access or RIC
- If **out of theatre**: call 777 declare an “**obstetric emergency**”
- Encourage **surgical control** of uterine tone & bleeding (see yellow box)
- Review with surgeon every 10mins: diagnosis & plan (see yellow box)
- If **massive bleeding + shock**: **tab 12e**
  - Call blood bank 6961: State “I am requesting **Obstetric Stat Pack**)
  - Give **1g tranexamic acid** slow push
- If **ongoing** massive bleeding + shock:
  - Call blood bank: State “I am **activating Obstetric MHP**”
  - Repeat **1g tranexamic acid** slow push
  - Refer to generic MHP steps in **tab 12e**  
(Teamwork, Regular calcium, Rapid infusion device, A line, Permissive hypotension, Warming, Bloods Q30min)
- Use **oxytocics** to address uterine atony:
  - **Oxytocin IV 5 units slow push**
  - **Oxytocin infusion 40unit in 500ml saline**. Infuse at 125ml/hr
  - **Ergometrine 500mcg IM** (avoid if ↑MAP)
  - **Carboprost 250mcg IM** (avoid if asthmatic). Can repeat every 15mins (max 8 doses)
  - **Misoprostol 1000mcg PR/vaginal**
- Perform **RSI** to enable surgical control (**spinal** only if haemodynamically **normal**). Consider:
  - Induction: **Ketamine 100mg** (1-2mg/kg), **suxamethonium 100mg**
  - Maintenance: **TIVA** or **volatile/nitrous**

### • Major causes of PPH:

- Tone (75%)
- Tissue/Retained placenta (15%)
- Trauma/Laceration (5-10%)
- Thrombosis/Coagulopathy
- Splenic artery rupture (rare)

### • **Surgical control** of bleeding can include:

- Pre-theatre: Uterine massage, bimanual compression, aortal compression
- Intra-op: BAKRI balloon, B Lynch suture, aortal compression, artery ligation, hysterectomy

- Vasopressors: **Metaraminol** 1mg; **phenylephrine** 100mcg, **Adrenaline**: 10-100mcg & titrate
- **Adrenaline/Noradrenaline** Infusion: 5mg in 50ml saline. Infuse at 10-20ml/hr preferably via CVC

## Main Priority: Oxygenation, Magnesium & Treating Hypertension

- Call **777** & state “**obstetric emergency**”
- Call for **eclampsia box**
- Give **O<sub>2</sub>** 15L/min via non-rebreather facemask
- Apply monitoring: SpO<sub>2</sub>, ECG, NIBP
- Start timer**: Measure length of seizure (eclamptic seizures normally self terminate)
- Maximise patient safety** while displacing gravid uterus (if antenatal):
  - Pillows & covered bed sides
  - Depending on staff safety: Lift uterus up & to left or place in **full left lateral**
- Prepare and give **Magnesium (2.5g/5ml) asap**:
  - **Loading dose**: 8ml with 12ml saline. Slow push over 5mins.  
(If no IV then give 10ml IM into each gluteal region (total 20ml))
  - Then **maintenance** infusion (see green box)
  - If repeat seizure give **rescue dose** (see green box)
- If ongoing seizures or seizure lasting >10mins**: then escalate treatment in turn:
  - Give **Midazolam IV 2mg bolus**, repeat every minute (max 10mg)  
(if no IV then use high concentration 5mg/ml **midazolam**: **Nasal**: 2ml via atomiser or **IM**: 2ml into deltoid)
  - Perform **RSI** & refer to ICU
- Post seizure**:
  - **Review A, B, C** & check **blood sugar level**
  - Send **blood tests** (FBC, LFTs, U&Es, uric acid, coag screen, Mg, G&H)
  - Consider chance of **aspiration**: SpO<sub>2</sub>, auscultate chest, perform chest XR (if needed)
  - If **bp >160/110mmHg** then consider one or both:
    - **Labetalol IV** (neat=5mg/ml): 2-4ml over 2min. Repeat every 10mins (max 3 doses)
    - **Hydralazine IV**: Dilute to 1mg/ml. Give 5ml slow push. Repeat every 20min
  - **Restrict total fluid** input to 80ml/hr & monitor hourly urine with catheter
- If antenatal**: Discuss with obstetric team: Plan for delivery of baby
- Consider **other causes** of seizure other than eclampsia: discuss with **neurologists**

- Check reflexes, sedation score & vitals: Initially every 30min, then hourly
- Serum magnesium levels are only needed if concurrent renal dysfunction:
  - Therapeutic Mg<sup>2+</sup> level = 2-4mmol/L
  - Send yellow top 1 hour after start of maintenance dose. Repeat levels every 4 hrs if concern
- If concern over magnesium toxicity: Stop infusion & give **calcium chloride 10% 5ml IV** push

- **Magnesium** (2.5g/5ml):
  - Maintenance: 1g/hr. Add 5 ampoules to 100ml saline. Infuse at 10ml/hr.
  - Rescue (i.e. another seizure): 2g bolus. Mix 4ml with 6ml saline. Give via slow IV push over 5mins
- **Labetalol** infusion: Add 100mg to saline to make 100ml. Infuse at 20ml/hr. Double rate every 30mins (max 160ml/hr)
- **Hydralazine** infusion: Dilute to 1mg/ml. Start infusion at 5ml/hr. Change rate by 1ml/hr every 20mins (max 20ml/hr)

## Main Priority: Recognition & Aggressive Resuscitation

- Get senior help or call 777 & declare an “**obstetric +/- neonatal emergency**”
- For all:** Start treatment for **haemorrhage & coagulopathy** tab 12e :
  - Call blood bank 6961. State:
    - “I am requesting **Obstetric Stat Pack**” *and* “I am activating **Obstetric MHP**”
  - Give **IV tranexamic acid 1g slow push**, repeat 30min later
  - Send urgent blood tests including FBC, coagulation studies, TEG (if available)
- If no cardiac output:** Start CPR & consider reversible causes tab 6e / tab 7e
  - If **antenatal** perform maternal specific CPR tasks:
    - Removal all foetal monitoring
    - **Lift uterus** skyward & displace to left
    - **Intubate early** & ventilate with EtCO<sub>2</sub> target of <30mmHg
    - Perform chest **compressions higher** on chest & **push deeper**
    - If **no rapid ROSC** then start **immediate** preparations to **deliver baby** within 5mins
- If signs of cardiac output:** Start resuscitation:
  - Ensure patent airway. Consider **early intubation**
  - Address **oxygenation**: High flow oxygen, BiPAP, CPAP or high PEEP
  - Give **blood & products** as MHP. Use **vasopressors** or **inotropes** as required
  - Perform early **ECHO** (TTE or TOE: Any signs of right heart dysfunction or pulmonary hypertension?)
- Discuss with **obstetricians**:
  - If antenatal: urgent delivery of baby
  - Rule out sources of haemorrhage (eg placenta, uterine rupture or tone, trauma)
  - Possibility of hysterectomy if uncontrollable bleeding
- Refer to ICU early (is ECMO a consideration? Does pulmonary hypertension need treatment?)

- Amniotic fluid embolism is rare, but life threatening. Always consider it in your differential
- **The following** features are suggestive of AFE:
  - hypotension, foetal distress
  - symptoms with no clear other explanation eg sudden agitation
  - peri-partum onset: during labour, delivery or within 30mins of baby delivery

System & Signs	Lab/Investigation Findings
<b>General</b> = Restless, anxious, chest pain, vomiting	Pulmonary hypertension
<b>Respiratory</b> = Hypoxia, bronchospasm, pulmonary oedema, ARDS	Right heart strain
<b>Cardiovascular</b> = Hypotension, chest pain, cardiac arrest	Coagulopathy
<b>Neurological</b> = Headaches, seizure, loss of consciousness	DIC
<b>Fetus</b> = Acute bradycardia	

- [Bolus]: **metaraminol** 1mg; **phenylephrine** 100mcg, **ephedrine** 9mg, **adrenaline** 10-50mcg
- [Infusions]: **noradrenaline/adrenaline** infusion: 5mg in 50ml. infuse 0-20ml/hr

# C&C Anaesthetic Crisis Handbook

Clickable links:

v3.3 Feb 2023

## DIAGNOSING Problems

Treating known  
**EMERGENCIES**

**ADULT DRUG**  
Formulary

**TELEPHONE**  
Directory

**PAEDS DRUG**  
Formulary

### For every problem:

- Never normalise the abnormal
- **Verbalise** the problem. Say out loud....  
    ‘We have a **problem**, I am **concerned**’
- Call for **help**
- **Set oxygen to 100%** (except where stated otherwise)
- Use indexed pages to facilitate diagnosis:
  - **Frequency gamble** common causes
  - Use a **structured approach** to consider all causes
- Seek to actively prove / disprove all possible causes

[www.AnaestheticCrisisHandbook.com](http://www.AnaestheticCrisisHandbook.com)

(Created by Adam Hollingworth with help from many people along the way)  
(C&C version localised by Hannah Janssens & Eilidh Menzies)

Adapted from various sources including:

- Guidelines: ANZAAG, AAGBI, NZRC, Starship Protocols
- vortexapproach.org. Dr Chrimes & Dr Fritz
- Hutt Valley & CCDHB: Clinical protocols
- ESA Emergency Quick Reference Guide
- CCDHB Crisis Checklists. Dr A McKenzie
- Emergencies in Anaesthesia. Oxford Handbook
- Wellington ICU Drug Manual. Dr A Psirides & Dr P Young
- Various published peer reviewed papers

# A

Airway

# B

Breathing

**25d. High Airway Pressure**

**26d. Low SpO<sub>2</sub>**

**27d. High EtCO<sub>2</sub>**

**28d. Low EtCO<sub>2</sub>**

**29d. Tachycardia**

**30d. Bradycardia**

**31d. Hypertension**

**32d. Hypotension**

# C

Circulation

**33d. Failure to wake**

**34r. TELEPHONE DIRECTORY**

**35r. ADULT DRUG FORMULARY**

**36r. PAEDS DRUG FORMULARY**

# E

Everything  
else

**Contents**  
**Emerg**

- Listen to chest.** Watch for bilateral chest rise & fall
- Switch to **bag** - manually ventilate to confirm high pressure
- Examine **EtCO<sub>2</sub> waveform** - ?bronchospasm ?kinked ETT
- Exclude **light anaesthesia** & inadequate **muscle relaxation**
- Perform a **systematic visual check**:
  - airway device (position or kinking) ⇒ filter ⇒ circuit ⇒ valves ⇒ ventilator
- Check **airway patent: suction full length** of ETT or **bronchoscopic exam**
- If suspect **autoPEEP** watch for persistent expiratory flow at end expiration. Try disconnecting circuit.
- If problem **not identified** :
  - **Exclude circuit**: replace circuit with Ambu-bag (if required convert to TIVA)
  - **Exclude filter**: replace or remove
  - **Exclude airway**: replace ETT. If using LMA convert to ETT
  - Not resolved = **patient problem**

• Consider timing of event eg CVL insertion, position change, surgical event

• **Possible causes** (most common in bold):

▸ **Circuit:**

- **ventilator settings**
- kinked tube
- valve failures
- obstructed filter
- O<sub>2</sub> flush failure

▸ **Patient:**

- **bronchospasm**
- chest wall rigidity
- anaphylaxis
- pneumothorax
- pneumoperitoneum
- obesity
- alveolar problems/pathology:
  - oedema
  - infections
  - ARDS
  - contusion
- tracheal problems/pathology :
  - FB
  - secretions
  - tumour

▸ **Airway:**

- **laryngospasm**
- **tube position**
- tube size
- blocked or kinked tube

- Check FiO<sub>2</sub> & turn to 100% O<sub>2</sub>
- Check patient colour, peripheral temperature & **probe position**
- Switch to bag** to test circuit integrity & lung compliance
- Check the SpO<sub>2</sub> & EtCO<sub>2</sub> waveforms to aid systematic diagnosis:
  - ▶ **If EtCO<sub>2</sub> waveform abnormal or absent:**
    - Exclude: disconnected circuit, cardiac arrest, ↓cardiac output
    - Consider laryngospasm or bronchospasm (if LMA convert to ETT)
    - **Check airway** position & patency:
      - Visualise cords = rule out **oesophageal intubation**
      - Look inside mouth for kinks/gastric contents
      - Suction full length of ETT or bronchoscopic exam
    - Check ventilator mode & setting
    - Ventilate via Ambu-bag to exclude ventilator/circuit/probe problem
  - ▶ **If EtCO<sub>2</sub> waveform normal:** (∴ intact circuit integrity):
    - Check fresh gas flow / FiO<sub>2</sub>
    - Exclude endobronchial ETT
    - Exclude pneumothorax: Neck veins, chest rise, auscultate or ultrasound
- Work through diagnostic checklist below to exclude all other causes

- Consider timing of event eg position change, surgical event
- **Possible causes** (most common in bold):
  - ▶ **Airway:**
    - **airway obstruction**
    - **laryngospasm**
    - **bronchospasm**
    - endobronchial intubation
    - oesophageal intubation
    - aspiration
  - ▶ **Lungs/Breathing:**
    - **apnoea/hypoventilation**
    - atelectasis
    - pneumothorax
    - pulmonary oedema - acute or negative pressure
    - sepsis/ARDS
    - contusion
    - pneumonia
    - interstitial lung disease
  - ▶ **Ventilator/Circuit/Probe:**
    - **probe displacement**
    - inadequate reversal
    - mal: function/setting
    - auto-PEEP
    - low fresh gas flow
    - oxygen supply failure
    - circuit obstruction/disconnection
  - ▶ **Circulation:**
    - cardiac arrest
    - heart failure
    - anaphylaxis
    - embolism: pulmonary, air, CO<sub>2</sub>, cement
    - hypothermia/poor peripheral circulation
    - methaemoglobinaemia e.g. prilocaine

Quick check patient monitors: ?oxygenated & anaesthetised patient:

- **Anaesthetist's A** <sup>Airway</sup> EtCO<sub>2</sub> , **B** <sup>SpO<sub>2</sub></sup> Vent Settings , **C** <sup>HR</sup> MAP , **D** <sup>Depth of</sup> anaesthesia , **E** <sup>Temp</sup>

This is generally not a crisis. Use the time to consider the causes

**Frequency gamble:**

- Check monitors & ventilator:
- **EtCO<sub>2</sub> waveform**
  - **Fresh Gas Flow** - correct for circuit type, size of patient
  - **Ventilator** settings & mode - Resp rate, Tidal volume
- Check **soda lime** ?exhausted
- Review:
- Anaesthetic **depth**
  - Recent **drug doses** for errors

**Systematically** work through all causes (see below)

- Consider timing of event eg drug administration, surgical event
- **Possible causes** (most common in bold):

#### ↑ Production

- *Endogenous:*
- sepsis/↑temp
  - MH
  - thyroid storm
  - malignant neuroleptic syndrome
  - reperfusion
- *Exogenous:*
- CO<sub>2</sub> insufflation
  - bicarb administration

#### ↓ Elimination

- *Lungs:*
- **hypoventilation**
  - bronchospasm/asthma
  - COPD
- *Circuit/machine:*
- ↓ **Fresh Gas Flow/re-breathing**
  - **incorrect vent settings**
  - **soda lime exhaustion**
  - airway obstruction
  - ↑ dead space
  - valve malfunction



□ Quick check patient monitors: ?oxygenated & anaesthetised patient:

- **Anaesthetist's** **A** Airway EtCO<sub>2</sub> , **B** SpO<sub>2</sub> Vent Settings , **C** HR MAP , **D** Depth of anaesthesia , **E** Temp

□ **If no EtCO<sub>2</sub> waveform** diagnose **immediately**:

- Incorrect ETT placement: "No Trace, Wrong Place". If in doubt, replace
- Severe bronchospasm - confirm airway **tab 4e**
- Check circuit & EtCO<sub>2</sub> sample line connections

□ **If low EtCO<sub>2</sub>** then first **frequency gamble**:

- Cardiac or peri-arrest?: **tab 6e** or **tab 7e**
- Check sampling line - securely connected & patent
- Examine patient:
  - Airway position & patency
  - Auscultate & ensure bilateral chest rise - (r/o laryngospasm/bronchospasm)
- Check ventilator:
  - Switched on & functioning
  - Correct settings: tidal volume, RR

□ **If problem not identified** work through causes **systematically** (see yellow box)

- Consider timing of event e.g. post intubation, drug administration, surgical event
- "No Trace, Wrong Place". Even in cardiac arrest without CPR; EtCO<sub>2</sub> should still be recordable
- If not an emergency or urgent, correlate EtCO<sub>2</sub> with ABG and PaCO<sub>2</sub>
- **Possible causes** (most common in bold):

▸ **NO EtCO<sub>2</sub>!!:**

- **oesophageal intubation**
- no ventilation, no airway
- cardiac arrest
- circuit/sampling line disconnection
- ventilator failure or not on
- apnoea

▸ **↓Production:**

- hypothermia
- deep anaesthesia
- ↓thyroid

▸ **Sampling dilution:**

- high FGF
- sampler placed incorrectly
- dilution of sampling gas with air
- circuit disconnected

▸ **↑Elimination:**

- **hyperventilation**

▸ **↓Transport of CO<sub>2</sub> in blood:**

- **severe hypotension/low CO state**
- anaphylaxis
- cardiac arrest
- embolism - air or pulmonary
- tamponade/tension pneumothorax

▸ **↓CO<sub>2</sub> diffusion in lung:**

- **low tidal volumes/dead space**
- **laryngospasm**
- **severe bronchospasm**
- ETT obstruction
- endobronchial intubation

# 29d. TACHYCARDIA

Contents  
Emerg | Diag

- Check patient monitors: is the patient oxygenated & anaesthetised?:
  - ▶ **Anaesthetist's A** Airway EtCO<sub>2</sub>, **B** SpO<sub>2</sub> Vent Settings, **C** HR MAP, **D** Depth of anaesthesia, **E** Temp
- If there is **diagnostic uncertainty & MAP <65 with HR >150** give **synchronised DC shock** (see yellow box for joules). Can repeat 3 times & give **amiodarone**
- Differentiate** sinus tachycardia & complex tachy-arrhythmia:
  - ▶ current surgical/pain stimulation
  - ▶ sinus rhythm?
  - ▶ QRS regularity?
  - ▶ QRS width?
- If **sinus tachycardia** consider causes (see yellow box below)
- If **complex tachy-arrhythmia** treat based on **MAP**:
  - ▶ MAP <65mmHg = **synchronised DC shock** (see yellow box for joules)
  - ▶ MAP >65mmHg = manage by **QRS width & regularity**:
    - **Broad:**
      - **Regular:**
        - ▶ [VT or WPW] **amiodarone**
        - ▶ [SVT with bundle block] see narrow
      - **Irregular:**
        - ▶ [AF with bundle block] see narrow
        - ▶ [torsades] **magnesium**
    - **Narrow:**
      - **Regular:**
        - ▶ [SVT]: vagal manoeuvres → **adenosine** → **β blocker**
      - **Irregular:**
        - ▶ [AF] **β blocker** or **amiodarone**
- Send urgent ABG. Ensure high normal K<sup>+</sup> & Mg<sup>2+</sup>

- Consider timing of event eg drug administration, surgical event etc.
- **Possible causes of sinus tachycardia** (most common in bold):
  - ▶ **Primary causes:**
    - IHD
    - cardiomyopathy
    - sick sinus syndrome
    - accessory conduction pathways
    - myocarditis
    - pericarditis
    - valvular disease
    - congenital heart disease
  - ▶ **Secondary causes:**
    - **hypovolaemia**
    - **anaesthesia depth**
    - **drugs** - incl drug error
    - **pain**
    - anaphylaxis
    - electrolyte abnormalities
    - cardiac tamponade
    - sepsis
    - thyroid storm
    - MH
- Synchronised shock guides:
  - ▶ AF/monomorphic VT: 100J ⇒ 150J ⇒ 200J (☹️ 0.5J/kg ⇒ 1J/kg ⇒ 2J/kg)
  - ▶ SVT or flutter: 100J ⇒ 200J (☹️ 0.5J/kg ⇒ 1J/kg ⇒ 2J/kg)
  - ▶ polymorphic VT or unstable: 150J ⇒ 200J (☹️ 4J/kg)

- **Adenosine:** 6mg, then 12mg, then 18mg then consider other causes (☹️ = 0.1mg/kg > 0.2mg/kg, 0.3mg/kg)
- β blocker: **Esmolol** 10mg titrated. **Metoprolol** 2.5mg boluses titrated (max 15mg)
- **Amiodarone:** 300mg over 10min (☹️ = 5mg/kg)
- **Magnesium:** [torsades] 10mmol (5ml of 49.3%) over 2min (☹️ = 0.1ml/kg). (Give slower for other causes)

29d

30d

- Quick check patient monitors: is the patient oxygenated & anaesthetised?:
  - ▶ **Anaesthetist's A** <sup>Airway</sup> EtCO<sub>2</sub> , **B** <sup>SpO<sub>2</sub></sup> Vent Settings , **C** <sup>HR</sup> MAP , **D** <sup>Depth of</sup> anaesthesia , **E** <sup>Temp</sup>
- If **MAP >65mmHg** you have time (see causes in yellow box)
- If **MAP <65mmHg +/-** with evidence of ↓perfusion then consider:
  - ▶ **Atropine 600mcg** upto **3mg** (👉 = 20mcg/kg)
  - ▶ **Glycopyrrolate 200mcg** upto **1mg** (👉 = 10mcg/kg)
  - ▶ **Ephedrine 9mg** bolus titrated (👉 = 0.1 mg/kg)
  - ▶ **Adrenaline** infusion (👉 **tab 36r**)
  - ▶ **Isoprenaline** infusion (👉 **tab 36r**)
  - ▶ **Dopamine** infusion (👉 **tab 36r**)
- If **drug toxicity or overdose**:
  - ▶ βblocker = as above + **high dose insulin** infusion, **Na bicarb** (if propanolol OD)
  - ▶ Ca channel = as βblocker + **10ml 10% Ca chloride** slow push (can repeat)
- If **severe refractory bradycardia** try external temporary pacing:
  - ▶ attach defib & ECG leads
  - ▶ set to PACER mode
  - ▶ select rate 60/min
  - ▶ ↑mA of output until capture (normally 65-100mA required)
  - ▶ set final mA 10mA above capture
  - ▶ confirm pulse
- If **PEA** at any point **start CPR** **tab 7e** **tab 8e**

- Consider timing of event eg drug administration, surgical event
- **Possible causes** (most common in **bold**):
  - ▶ **Primary causes:**
    - **athlete**
    - IHD
    - AV block
    - pacemaker malfunction
    - cardiomyopathy
    - sick sinus syndrome
    - myocarditis
    - pericarditis
    - valvular heart disease
    - pulmonary HTN
  - ▶ **Secondary causes:**
    - **vagal stimulation**
    - **drugs** eg error, overdose, anti-arrhythmics
    - electrolyte abnormality
    - ↓thyroid
    - ↓temperature
    - ↑ICP
    - cardiac tamponade
    - tension pneumothorax
  - ▶ **Anaesthetic causes:**
    - **vasopressors**
    - **volatile**
    - **suxamethonium**
    - **opioids**
    - **high/total spinal**
    - anticholinesterases
    - hypoxia
    - auto-PEEP
    - MH
    - ↑↓K<sup>+</sup>
- For paediatric normal heart rates: **tab 9e**

- **Isoprenaline:** Dilute 1mg (5vials) into 50ml. Infuse at 0-60ml/hr
- **Adrenaline:** 5mg in 50ml saline. Infuse at 0-20ml/hr
- **Dopamine:** 100mg in 50ml saline. Infuse at 0-20ml/hr
- **Na bicarb 8.4%** [β blocker OD]: 50ml slow push. Can repeat every 2min (target pH 7.45-7.55)
- **High dose insulin** [β blocker/CCB OD]: **Bolus= 50ml of 50% dextrose & 70u actrapid.**  
**Infusion= 100u actrapid** in 50ml saline, run at 35ml/hr and 10% dex run at 250ml/hr  
 (monitor BSL & K every 30mins)

- Quick check patient monitors: is the patient oxygenated & anaesthetised?:
  - **Anaesthetist's A** Airway EtCO<sub>2</sub>, **B** SpO<sub>2</sub> Vent Settings, **C** HR MAP, **D** Depth of anaesthesia, **E** Temp
- Check accuracy** of reading: check equipment (including transducer height)
- Frequency gamble on **common** causes:
  - Check for painful surgical activity - give **analgesia**
  - Check recent drug infusions & recent doses **for drug error** (incl. LA with adrenaline)
  - Check **tourniquet** time
  - Consider **bladder** volume/fluids infused
- Systematically work** through possible causes (see yellow box)
- Once all reversible causes have been addressed then consider **IV antihypertensive agents** (as green box below) to **SBP** target of ~160mmHg

- Consider timing of event eg drug administration, surgical event
- **Possible causes** (most common in bold):
  - **Anaesthesia:**
    - **too light**
    - **pain**
    - **drugs** - consider error
    - hypoxia
    - hypercapnia
    - MH
    - IV line - non-patent/tissued
    - A line transducer height
  - **Patient related:**
    - **essential HTN**
    - rebound HTN - B blocker stopped
    - full bladder
    - pre-eclampsia
    - renal disease
    - phaeochromocytoma (always give a blocker before β blocker)
    - thyroid storm
    - ↑ICP
  - **Surgery:**
    - **pneumoperitoneum**
    - tourniquet
    - aortic clamping
    - carotid endarectomy
    - baroreceptor stimulation

- *β Blocker* = **esmolol**: 10mg boluses titrated; **metoprolol**: 2.5mg boluses titrated (max 15mg)
- *α Blocker* = **labetalol** (also β blocker): 5mg boluses titrated (max 100mg). **phentolamine**: 5-10mg IV repeated every 5-15mins
- *α Agonists* = **clonidine**: 30mcg boluses titrated (max 150mcg)
- *vasodilators* = **GTN**: S/L spray or IV infusion: 50mg in 50ml saline at 3ml/hr and titrate; **magnesium**: slow bolus 5ml of 49.3%, repeat if required

- Check patient monitors: is the patient oxygenated & anaesthetised?:
  - **Anaesthetist's A** <sup>Airway</sup> EtCO<sub>2</sub> , **B** <sup>SpO<sub>2</sub></sup> Vent Settings , **C** <sup>HR</sup> MAP , **D** <sup>Depth of</sup> anaesthesia , **E** <sup>Temp</sup>
- Check accuracy** of reading: check equipment (including transducer height)
- Assess **severity**: visualise patient, check ECG & EtCO<sub>2</sub>/SpO<sub>2</sub> waveform:
  - **No cardiac output or critical MAP**: start **CPR**: **tab 6e** or **tab 7e**
  - **MAP <65mmHg & concern** then consider:
    - Leg elevation
    - Rapid infusion of fluid +/- ready to transfuse blood **tab 12e**
    - IV **vasopressors** or **inotropes**
- Consider **reversible causes**:
  - Frequency gamble on common causes
  - Systematically consider each cause in turn
- Consider:
  - ECHO (if skilled) to help differentiate causes
  - Other invasive monitoring to assist with diagnosis e.g. PPV SWV from arterial line, cardiac index monitoring

- Consider timing of event e.g. drug administration, surgical event, scope surgery (always suspect concealed haemorrhage)
- **Possible causes** (most common in bold):
  - **↓Preload**:
    - blood loss/**hypovolaemia**
    - **↑intrathoracic pressure**
    - ↓VR - eg IVC compression, pt position, pneumoperitoneum
    - tamponade/tension pneumothorax
    - embolism
  - **↓Contractility**:
    - **drugs** incl. **volatiles**
    - IHD
    - cardiomyopathy
    - myocarditis
    - arrhythmia
    - valvular heart disease
  - **↓Afterload**:
    - **drugs** eg vasodilators incl **anaesthetic agents, opioids**, antiHTN drugs
    - **neuraxial techniques**
    - sepsis
    - tourniquet or clamp release
    - anaphylaxis
    - addisons crisis
    - ↓thyroid
  - **Equipment/human**:
    - **artefact or failure**
    - Invasive: **wrong transducer height**
    - NIBP: wrong cuff size
    - drug error
- ECHO: Consider LVEDV, LV function, gross valvular abnormality
- PPV SWV: >12% (only if: intubated, paralysed, Vt >8ml/kg, in sinus rhythm, norm abdo pressure) suggests hypovolaemia
- Normal CI = >2.6 L/min/m<sup>2</sup>

- **Pressors**: **metaraminol** 0.5mg (👎 10mcg/kg); **phenylephrine** 100mcg, **ephedrine** 9mg (👎 0.25mg/kg), **adrenaline** 10-50mcg
- **noradrenaline/adrenaline** infusion: 5mg in 50ml. infuse 0-20ml/hr

# 33d. FAILURE TO WAKE

Contents  
Emerg | Diag

- This is generally not a crisis. Use the time to consider the causes
- Airway:** ensure patent unobstructed airway
- Breathing:**
  - ▶ Ensure established respiratory pattern
  - ▶ Check SpO<sub>2</sub>
  - ▶ Check EtCO<sub>2</sub> trace and value
- Cardiovascular:** Ensure normal HR, MAP and ECG
- Drugs:** Review **all drugs** given during anaesthetic:
  - ▶ Check muscle relaxation with nerve stimulator. Give **reversal agent** (see green box)
  - ▶ Consider timing and infusions of all agents
  - ▶ Consider drug errors
  - ▶ Consider drug interactions
  - ▶ Consider patient factors eg. renal/hepatic failure, elderly
- Others:
  - ▶ **Neurological:**
    - check pupils
    - apply BIS for signs of seizure (frontal lobe seizure only)
    - consider need for CT
  - ▶ **Metabolic:** send an ABG - check PaO<sub>2</sub>, PaCO<sub>2</sub>, Na, glucose
  - ▶ **Temperature:** ensure normothermia
- Systematically** work through all causes (see below)

## • Possible causes (most common in bold):

### Drugs:

- ▶ **analgesic agents** e.g. opioids, α<sub>2</sub> agonists
- ▶ **anaesthetic agents** e.g. volatile, propofol
- ▶ **muscle relaxants** e.g. suxamethonium apnoea, inadequate reversal
- ▶ sedative agents e.g. benzodiazepines, anticholinergics, antihistamines, antidopaminergics
- ▶ magnesium toxicity

### Metabolic:

- ▶ ↑↓**blood sugar**
- ▶ ↑↓sodium
- ▶ ↑urea

### Hypothermia

### Respiratory Failure:

- ▶ hypoxia or hypercapnia:
  - ↓central drive e.g. stroke, COPD
  - lung disease e.g. PE, ARDS
  - muscle power e.g. obesity

### Neurological:

- ▶ **stroke** - infarct, bleed or embolism
- ▶ seizure (Non-convulsive status epilepticus or post-ictal)
- ▶ local anaesthetic toxicity

### Other - Uncommon:

- ▶ central anticholinergic syndrome
- ▶ dissociative coma
- ▶ thyroid failure
- ▶ toxicity of other CNS drugs

- [rocuronium/vecuronium relaxant]: **Sugammadex** dose on TBW: PTC>2 = 4mg/kg (70kg=280mg); >T<sub>2</sub> = 2mg/kg (70kg=140mg)
- [all non-depolarising relaxants]: **Neostigmine** 2.5mg (👤 = 50mcg/kg) & **glycopyrrolate** 500mcg (👤 = 10mcg/kg). Rpt at 15min
- [suxamethonium apnoea]: No reversal option ⇒ continue anaesthesia/refer to ICU

33d

34r

## EMERGENCY OUT OF THEATRE

- MET Team 777

## ANAESTHETICS & THEATRES

- Duty Anaesthetist #6899 (021 199 8316)
- Duty Technician #6345 (027 443 3167)
- Theatre Coordinator 80496 (04 806 0496)
- PACU Coordinator 80726
- Perfusionist via switchboard, dial 0

## OBSTETRICS

- Obstetric Anaesthetist #6885 (027 554 4632)
- Obstetric Registrar 021 199 8244
- Delivery Technician #6577 (027 231 0488)
- Charge Midwife 80845
- NICU Doctor 021 199 8286

## LABORATORY/X-RAY

- Blood bank 6961
- Blood tests 6060
- X-Ray Technician 6699
- Duty Radiologist 8am- 5pm - #6903 Out of hours - #6135

## REFERRALS

- ICU Doctor 80444 (021 199 8301)
- ICU Coordinator 80431
- Haematology Doctor via switchboard, dial 0
- Surgical Doctor #6936 (027 765 4339)
- Paediatric Doctor #6351 (021 199 8306)
- Cardiology Doctor via switchboard, dial 0

# 35r. ADULT DRUG FORMULARY

Contents  
Emerg | Diag

Drug	Bolus	Infusion
<b>Adenosine</b>	6mg, then 12mg, then 12mg.	-
<b>Adrenaline</b> (1:1,000 = 1mg/ml) (1:10,000 = 100mcg/ml)	[Arrest] 10ml of 1:10,000 (1mg) [Other] 0.1ml - 1ml of 1:10,000 (10-100mcg). Titrate	5mg in 50ml saline. Infuse 0-20ml/hr
<b>Alteplase</b>	[Cardiac arrest] 50mg slow push. Can rpt at 15min [Peri-arrest] 20mg slow push	[Peri-arrest] 80mg in 20ml saline. Infuse at 10ml/hr
<b>Aminophylline</b>	400mg over 15mins	50mg in 50ml at 35ml/hr
<b>Amiodarone</b>	300mg slow push	900mg in 500ml D5W over 24hours
<b>Ca<sup>2+</sup> Chloride</b> (10%)	10ml slow push	-
<b>Clonidine</b>	30mcg. Titrate (max 150mcg)	-
<b>Dobutamine</b>	-	250mg in 50ml saline. Infuse 0-10ml/hr
<b>Esmolol</b>	10mg. Titrate	-
<b>GTN</b>	[tocolytic] 100-250mcg	[ischaemia] 50mg in 50ml saline. Infuse 3-12ml/hr. Titrate to MAP/ECG
<b>Hydralazine</b>	Dilute to 1mg/ml. Give 5ml slow push. Repeat every 20min (max 30ml)	Dilute to 1mg/ml. Start infusion at 5ml/hr. Change rate by 1ml/hr every 20mins (max 20ml/hr)
<b>Hydrocortisone</b>	200mg	-
<b>Insulin (actrapid)</b>	[βblocker or CCB OD] 50ml of 50% dextrose & 70u actrapid (1u/kg). Give as bolus.	[↑K <sup>+</sup> ] 10units in 250ml 10% dextrose. Infuse quickly [βblocker or CCB OD] 100u actrapid in 50ml saline, run at 35ml/hr and 10% dextrose run at 250ml/hr. check BSL & k /30min
<b>Intralipid</b> (20%)	100ml bolus (1.5ml/kg), Rpt every 5min, max x2	1000ml/hr (15ml/kg/hr). Can double rate @5mins (max total dose = 12ml/kg)
<b>Isoprenaline</b>	200mcg into 20ml saline. Give 1ml boluses titrated	1mg into 50ml saline. Infuse at 0-60ml/hr
<b>Ketamine</b>	[induction] 70-140mg (1-2mg/kg) [bronchospasm] 35-70mg (0.5-1mg/kg)	-
<b>Labetalol</b>	5-20mg slow push. Titrate (max 100mg)	[eclampsia]: Add 100mg to saline to make 100ml volume. Infuse at 20ml/hr. Double rate every 30mins (max 160ml/hr)
<b>Lignocaine</b> (1%) (1ml = 10mg)	[Arrhythmia] 7ml (0.1ml/kg). Can rpt every 10mins (max 0.3ml/kg)	Neat 1% at 6-24ml/hr. (Total max in 1hr = 30ml ie 3mg/kg)
<b>Magnesium</b> (49.3%) (1ml = 2mmol = 0.5g)	[bronchospasm] 5mls over 20min [torsades] 5ml slow push [eclampsia] 8ml in 12ml saline. Infuse at 120ml/hr	[eclampsia]: Maintenance = add 16ml to 100ml saline. Infuse at 14.5ml/hr Rescue (another seizure). 4mls in 6ml saline. Push over 5min
<b>Metaraminol</b>	0.5-1mg. Titrate	10mg in 20ml saline. Infuse 0-40ml/hr
<b>Metoprolol</b>	1-2.5mg. Titrate (max 15mg)	-
<b>Midazolam</b>	[seizures] 1-7mg. Titrate	-
<b>Milrinone</b>	-	10mg in 50ml saline. Infuse at 5ml/hr or 10ml/hr only
<b>Naloxone</b>	[emergency] 400mcg [titration] 40mcg (max 800mcg)	Infusion with hourly rate = 2/3 of bolus dose required for initial clinical effect
<b>Noradrenaline</b>	-	5mg in 50ml saline. Infuse 0-20ml/hr
<b>Oxytocin</b>	[elective] 3units slow bolus (do not repeat) [emergency] 5units slow bolus (do not repeat)	40units in 1000ml saline. Infuse 250ml/hr
<b>Phentolamine</b>	5-10mg. Repeat every 5-15 mins as required	-
<b>Phenylephrine</b>	100mcg bolus. Titrate	10mg in 100ml saline (100mcg/ml). Infuse 0-40ml/hr
<b>Salbutamol</b>	250mcg slow push (Inhaled: 12 puffs via circuit)	5mg in 50ml saline. Infuse 0-10ml/hr
<b>Sodium Bicarb</b> (8.4%) (target pH 7.45-7.55)	25-50ml slow push. Can repeat every 2mins	-
<b>Sugammadex</b>	[emergency post intubation] = 16mg/kg; [PTC>2] 4mg/kg; [>T <sub>2</sub> ] = 2mg/kg	
<b>Suxamethonium</b>	[laryngospasm] 35mg (0.5mg/kg)	
<b>Tranexamic Acid</b>	1g over 10mins (15mg/kg)	1g in 100ml saline. Infuse at 12.5ml/hr (8hrs)
<b>Vasopressin</b>	1unit slow push	20units in 20ml saline. Infuse 1-4ml/hr

35r

36r



# 36r. PAEDIATRIC DRUG FORMULARY

Contents  
Emerg | Diag

Drug	Bolus	Infusion
<b>Adenosine</b>	0.1mg/kg, then 0.2mg/kg, then 0.3mg/kg	-
<b>Adrenaline</b> (1:1,000 = 1mg/ml) (1:10,000 = 100mcg/ml)	[Arrest IV] 0.1ml/kg 1:10,000 (10mcg/kg) [Arrest ETT] 0.1ml/kg of 1:1,000 (100mcg/kg) [Other] 0.01-0.05ml/kg 1:10,000 (1-5mcg/kg) [IM dose] 0.01ml/kg of 1:1,000 (10mcg/kg)	[↓bp] 0.15mg/kg (max 5mg) in 50ml saline. Infuse 0.5-10ml/hr
<b>Aminophylline</b> (25mg/ml)	10mg/kg (max 500mg) over 1hr diluted to 50ml with saline	1-9yrs: 55mg/kg made to 50ml with 5% dex. infuse 1ml/hr 10-15yr & <35kg: 35mg made to 50ml with 5% dex. infuse 1ml/hr 10-15yr & >35kg: neat drug. infuse 0.028ml/kg/hr
<b>Amiodarone</b>	5mg/kg slow push (max 300mg)	-
<b>Atropine</b>	20mcg/kg	-
<b>Ca<sup>2+</sup> Chloride</b> (10%)	0.05 - 0.2ml/kg (max 10ml) slow push	-
<b>Dobutamine</b>	-	15mg/kg in 50ml saline. infuse 0.5-4ml/hr
<b>Ephedrine</b>	0.25mg/kg (max 9mg/dose)	-
<b>Esmolol</b>	500mcg/kg slow push. Titrate	-
<b>Glycopyrrolate</b>	10mcg/kg	-
<b>Hydrocortisone</b>	[asthma] 4mg/kg	-
<b>Insulin (actrapid)</b>	[↑K] Periph IV: 0.1unit/kg in 5ml/kg 10% dex [↑K] CVL: 0.1u/kg in 2ml/kg 50% dex	-
<b>Intralipid</b> (20%)	1.5ml/kg bolus. Repeat every 5min, max x2	15ml/kg/hr. Can double rate @5min (max total dose=12ml/kg)
<b>Isoprenaline</b>	-	300mcg/kg in 50ml saline. Infuse at 1ml/hr (0.1mcg/kg/min) and titrate up (max 10ml/hr)
<b>Ketamine</b>	[bronchospasm & anaesthetised] 0.5-2mg/kg	-
<b>Labetalol</b>	0.25-0.5mg/kg slow push. rpt ev. 10min as req'ed	50mg/kg & saline to make 50ml. Infuse 0-3ml/hr (0-3mg/kg/hr)
<b>Lignocaine 1%</b> (1ml=10mg)	[arrhythmia] 0.1ml/kg. Can rpt every 10mins (max 0.3ml/kg)	-
<b>Magnesium</b> (49.3%) (1ml = 2mmol = 0.5g)	[asthma] 0.1ml/kg (max 5ml) in 50ml saline over 20mins	-
<b>Metaraminol</b>	10mcg/kg	-
<b>Metoprolol</b>	0.1mg over 5mins	-
<b>Midazolam</b>	[seizures] IV: 0.1mg/kg; IM 0.2mg/kg; buccal 0.5mg/kg. Can repeat dose @ 5mins	-
<b>Naloxone</b>	[emergency] 10mcg/kg (max 400mcg) [titrate] 2mcg/kg (400mcg in 20ml give 0.1ml/kg)	300mcg/kg to 30ml 5% dex & run at 0-1ml/hr (10mcg/kg/hr)
<b>Noradrenaline</b>	-	0.15mg/kg (max 5mg) in 50ml saline. Infuse 0.5-10ml/hr
<b>Phenylepherine</b>	2-10mcg/kg. Titrate	10mg in 100ml saline. Infuse 0-20ml/hr (1-5mcg/kg/min)
<b>Salbutamol</b>	Inhaled: <5yr=6puffs; >5yrs 12puffs via circuit IV: 10mcg/kg over 2 min (max 500mcg). Rpt @10min	Infuse 5-10mcg/kg/min for 1 hour, then reduced to 1-2mcg/kg/min. <16kg: 3mg/kg made to 50ml with 5%dex. Then 1ml/hr = 1mcg/kg/min; >16kg: Use 20ml of 1mg/ml solution. Then ml/hr = 0.06 x kg x dose (mcg/kg/min) See <a href="#">Starship clinical guidelines for infusion chart</a>
<b>Sodium Bicarb</b> (8.4%)	1ml/kg over 5min. Can repeat every 2mins (target pH 7.45-7.55)	-
<b>Sugammadex</b>	[emergency post intubation] = 16mg/kg; [PTC>2] 4mg/kg; [>T <sub>2</sub> ] = 2mg/kg	-
<b>Suxamethonium</b>	[intubation] IV: 2mg/kg; IM 4mg/kg [non-emergency laryngospasm] 0.5mg/kg	-
<b>Tranexamic Acid</b>	15mg/kg diluted in 20-50ml saline over 10min. (Max 1g)	2mg/kg/hr in 500ml saline for 8hrs
<b>Vasopressin</b>	-	1 unit/kg in 50ml saline. Infuse 1-3ml/hr

Clickable links:

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**PAEDS DRUG**  
Formulary

# C&C Anaesthetic Crisis Handbook

[www.AnaestheticCrisisHandbook.com](http://www.AnaestheticCrisisHandbook.com)

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**DIAGNOSING**  
Problems

Version 3.3, Feb 2023

Disclaimer: Every effort has been taken to prevent errors/omissions/mistakes. However, this cannot be guaranteed. Graded assertiveness to query team leader decisions/management steps which are contrary to this manual are encouraged. However, clinical experience & acumen are vital in complex situations such as crises and may be more appropriate than this handbook in certain situations.