# EMERGENCY PROMPT CARDS

**Encouraging safe and prompt care during emergencies**

Editors: Talia Barry and Vicki Cowling

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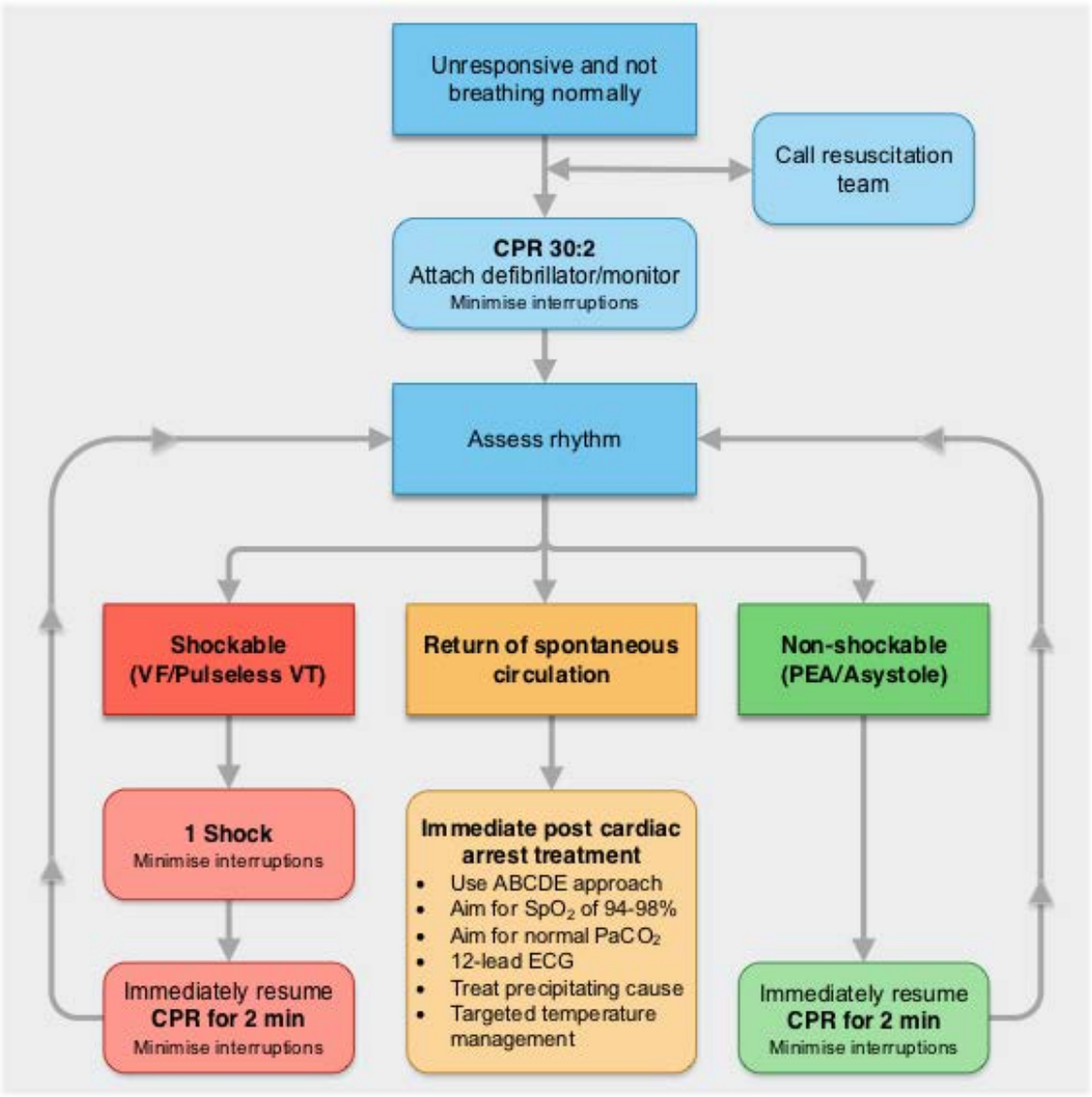
# ALS: ADULT ADVANCED LIFE SUPPORT

Resuscitation Council (UK) GUIDELINES 2015 Adult Advanced Life Support




**During CPR**

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

**Treat Reversible Causes**

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia
- Thrombosis - coronary or pulmonary
- Tension pneumothorax
- Tamponade – cardiac
- Toxins

**Consider**

- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

## DRUG DOSES:

**Adrenaline** 1mg (10ml 1:10,000 IV)
Shockable - after third shock, then every alternate cycle
Non-shockable - as soon as able, then every alternate cycle

**Amiodarone** 300mg bolus IV after the third shock (diluted to 20ml with 5% dextrose)
Further dose of 150mg after 5th shock if VF/VT persists

**Magnesium Sulphate** 2g 50% mgSO4 IV over 1-2 mins in Torsades (2g = 8mmol = 4mls)

**REF:**
https://www.resus.org.uk/sites/default/files/2020-01/G2015_Adult_ALS.pdf

# ALS 4H'S 4T'S: REVERSIBLE CAUSES

**DRUG DOSES LISTED HERE ARE FOR PATIENTS IN CARDIAC ARREST ONLY, IF ROSC DO NOT USE THESE DOSES/SPEEDS OF ADMINISTRATION**

**Hypoxia** (History)
ALS Algorithym - 100% o2 achieving good chest wall movement

**Hypovolemia** (History, Hb on VBG)
IVF, consider blood and major haemorhage call

**Hypo/Hyperkalaemia/Glu/Ca++/Mg+** (VBG, history)
**Hyperkalaemia:** 10mls 10% Calcium Chloride IV bolus
Then shift with 10 units actrapid in 50mls 50% dextrose rapid IV push,
If severe acidosis or renal failure consider 50ml 8.4% sodium bicarbonate rapid IV push,
Consider dialysis
**Hypokalaemia:** FOR USE ONLY IN CARDIAC ARREST - 2mmol K+/min for 10 minutes then 10 mmol over 5-10 mins + replace MgSO4 (2g 50% MgSO4, over 1-2 minutes )
**Hypercalcemia:**
**Hypocalcaemia:**
**Hypermagnesaemia:**
**Hypomagnesaemia:**

| Disorder | Causes | Presentation | ECG | Treatment |
|---|---|---|---|---|
| **Hypercalcaemia**<br>Total Calcium*<br>> 2.6 mmol l⁻¹ | Primary or tertiary hyperparathyroidism<br>Malignancy<br>Sarcoidosis<br>Drugs | Confusion<br>Weakness<br>Abdominal pain<br>Hypotension<br>Arrhythmias<br>Cardiac arrest | Short QT interval<br>Prolonged QRS interval<br>Flat T waves<br>AV block<br>Cardiac arrest | Fluid replacement IV<br>Furosemide 1mg kg⁻¹ IV<br>Hydrocortisone 200 - 300mg IV<br>Pamidronate 30 - 90mg IV<br>Treat underlying cause |
| **Hypocalcaemia**<br>Total Calcium*<br>< 2.1 mmol l⁻¹ | Chronic renal failure<br>Acute pancreatitis<br>Calcium channel blocker overdose<br>Toxic shock syndrome<br>Rhabdomyolysis<br>Tumour lysis syndrome | Paraesthesia<br>Tetany<br>Seizures<br>AV - block<br>Cardiac arrest | Prolonged QT interval<br>T wave inversion<br>Heart block<br>Cardiac arrest | Calcium chloride 10% 10 - 40ml IV<br>Magnesium sulphate 50%<br>4 - 8 mmol (if necessary) IV |
| **Hypermagnesaemia**<br>[Magnesium]<br>> 1.1 mmol l⁻¹ | Renal failure<br>Iatrogenic | Confusion<br>Weakness<br>Respiratory depression<br>AV - block<br>Cardiac arrest | Prolonged PR and QT intervals<br>T wave peaking<br>AV - block<br>Cardiac arrest | Consider treatment when [Magnesium] > 1.75 mmol l⁻¹<br>Calcium chloride 10% 5-10ml IV repeated if necessary<br>Ventilatory support if necessary<br>Saline diuresis - 0.9% saline |
| **Hypomagnesaemia**<br>[Magnesium]<br>< 0.6 mmol l⁻¹ | GI loss<br>Polyuria<br>Starvation<br>Alcoholism<br>Malabsorption | Tremor<br>Ataxia<br>Nystagmus<br>Seizures<br>Arrhythmias - torsade de pointes<br>Cardiac arrest | Prolonged PR and QT intervals<br>ST-segment depression<br>T-wave inversion<br>Flattened P waves<br>Increased QRS duration<br>Torsade de pointes | Severe or symptomatic:<br>2 g 50% magnesium sulphate (4 ml; 8 mmol) IV over 15 min.<br>Torsade de pointes:<br>2 g 50% magnesium sulphate (4 ml; 8 mmol) IV over 10 min.<br>Seizure:<br>2 g 50% magnesium sulphate (4 ml; 8 mmol) IV over 10 min. |

**Table 12.1 Calcium and magnesium disorders**

* A normal *total calcium* is about 2.2 to 2.6 mmol l⁻¹. A normal *ionized calcium* is about 1.1 to 1.3 mmol l⁻¹. Calcium values need to be interpreted with caution. Seek expert help if not sure. Total calcium depends on serum albumin values and will need to be corrected for low albumin values (corrected total calcium). Ionized calcium values are often measured by blood gas machines. It is important not to confuse ionized calcium, total calcium and corrected calcium values.

**Hypothermia/Hyperthermia** (Temperature)
Hypothermia: Amend ALS algorithm drug dosing as per hypothermia (see next page) and consider ECMO
Hyperthermia: Start active cooling, if malignant hyperthermia use dantrolene (see next page)

**Thrombosis - coronary or pulmonary** (History, Pre-Hospital ECG, Echo can assist but RV dilatation does not automatically mean PE)
**Coronary:** Needs PCI
**Pulmonary**: Alteplase 50mg IV bolus then consider a further dose of 50mg after 30 mins CPR if no ROSC. If fibrinolytics given perform CPR for 60-90 mins (consider using an auto pulse)
Consider extracorporeal CPR +/- surgical or mechanical thrombectomy

**Tension pneumothorax** (History and exam, consider US)
Needle decompression 5th IC space just anterior to the mid axillary line or thoracostomy and then definitive chest drain (can use

**Tamponade** (Cardiac US)
Pericardiocentesis - consider thoracotomy in traumatic cardiac arrest.

**Toxins** (History)
Consider antidotes if applicable (see toxins page for more info), treatment usually supportive
**In TCA overdose**: give Sodium Bicarbonate 50mmol (50ml of an 8.4% solution) - DO NOT give simultaneously by the same route as calcium solutions
**In Calcium Channel Blocker overdose:** IV Calcium Chloride 10ml IV Bolus

**REF:**
Advanced Life Support Manual 7th Edition Nov 2015 Resuscitation Council (UK)

# ALS: SPECIAL CIRCUMSTANCES

## Drowning

Early intubation, dry chest prior to placement of defib pads, suctioning, check temperature, IV fluids

## Hyperthermia

>40.6℃ = severe and high risk of death if not cooled
COOLING: Active (cooled fluids, lavage, cooling blankets) and passive (remove clothing, fans, ice packs in groin), can consider ECMO
If MALIGNANT HYPERTHERMIA: consider dantrolene (2-3mg/Kg initially then 1mg/Kg repeated if needed - max 10mg/Kg), rapidly and persistently correct acidosis, electrolytes and arrhtymias - avoid Calcium Channel blockers asthey interact with dantrolene

## Hypothermia

<28℃ = severe, 28-32℃ = moderate, 32-35℃ = mild
Measure temp with low reading thermometer (ideally oesophageal)
SHOCKS: 3 shocks, if VF persists delay shocks until temp >28℃
DRUGS: Withhold until warmed to 30℃, then double intervals between medications until >35℃
PACING: Do not pace unless re-warmed
REWARMING: Passive (remove wet cloths, blankets) and active (warmed IVF, peritoneal lavage, humidified warm air)
ADJUNCTS: Consider ECMO/bypass if <32℃ and K+ <8 mmol/L
TERMINATING RESUS: Check for signs of life for 1 min, can only confirm death once >35℃

## Pregnancy

Early intubation
Displace uterus once >20/40: Manually displace the uterus to the left or if table will tilt place in 15-30% lateral tilt (DO NOT use pillows and wedges if performing CPR as firm surface required for quality CPR)
Ensure IV or IO access its placed above the diaphragm
Prepare for resuscitative hysterectomy (emergency c-section) if intial resuscitation attempts fail:

- Contact O+G, anaesthetics and neonatology
- Under 20 weeks: No need to consider
- 20-23 weeks: Fetus unlikely to be viable but delivery will increase liklihood of maternal resuscitation
- >24 weeks: Initiate delivery to help save life of both baby and mother

Consider additional differentials: pre-eclampsia/amniotic fluid embolism/PE

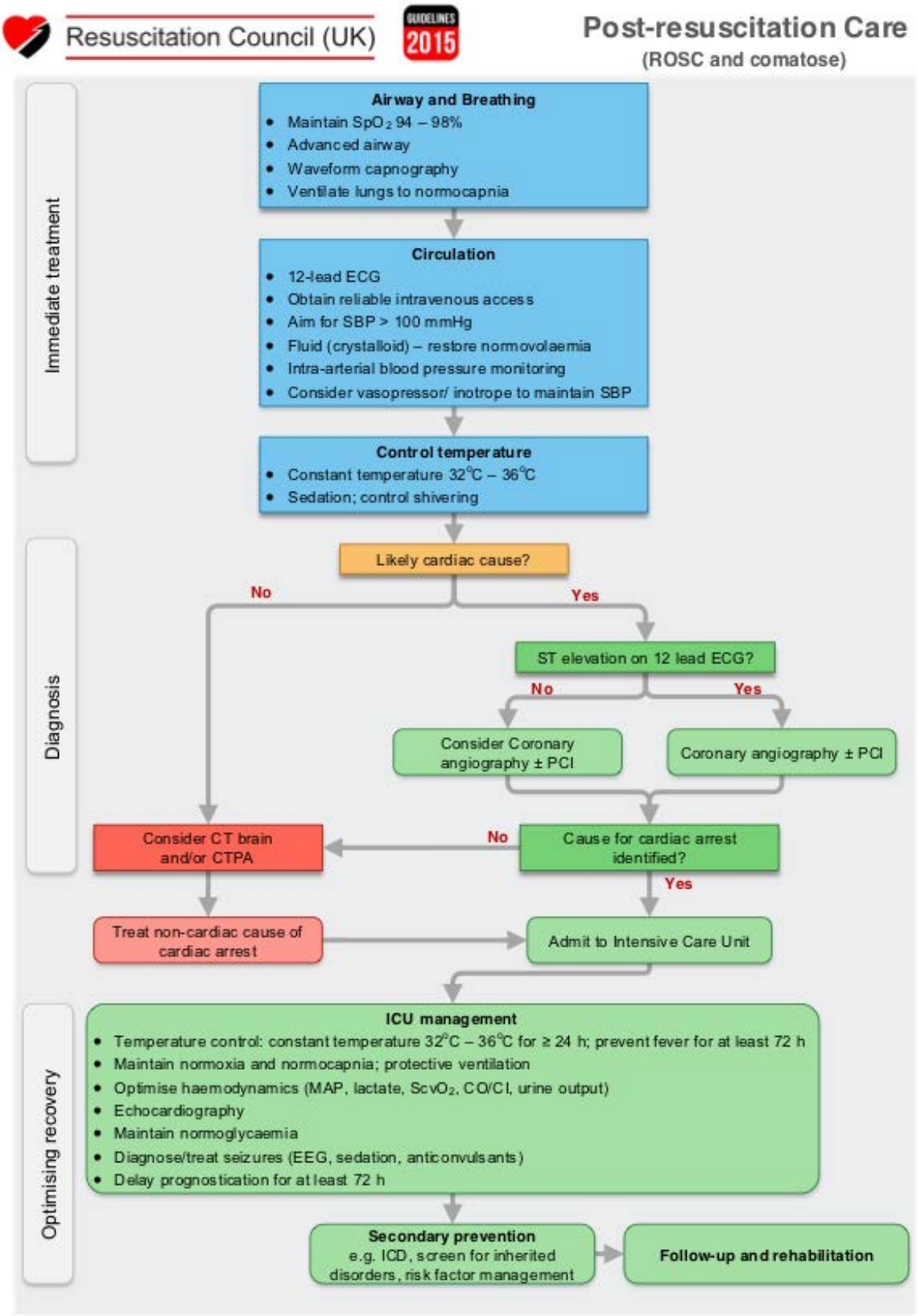
**REF:**
Advanced Life Support Manual 7th Edition Nov 2015 Resuscitation Council (UK)
Malignant Hyperthermia CrisisAAGBI Safety Guideline, https://anaesthetists.org/Portals/0/PDFs/Guidelines%20PDFs/Guideline_malignant_hyperthermia_laminate_2011_final.pdf?ver=2018-07-11-163754-770&ver=2018-07-11-163754-770

# ALS: ADULT EMERGENCY DRUGS

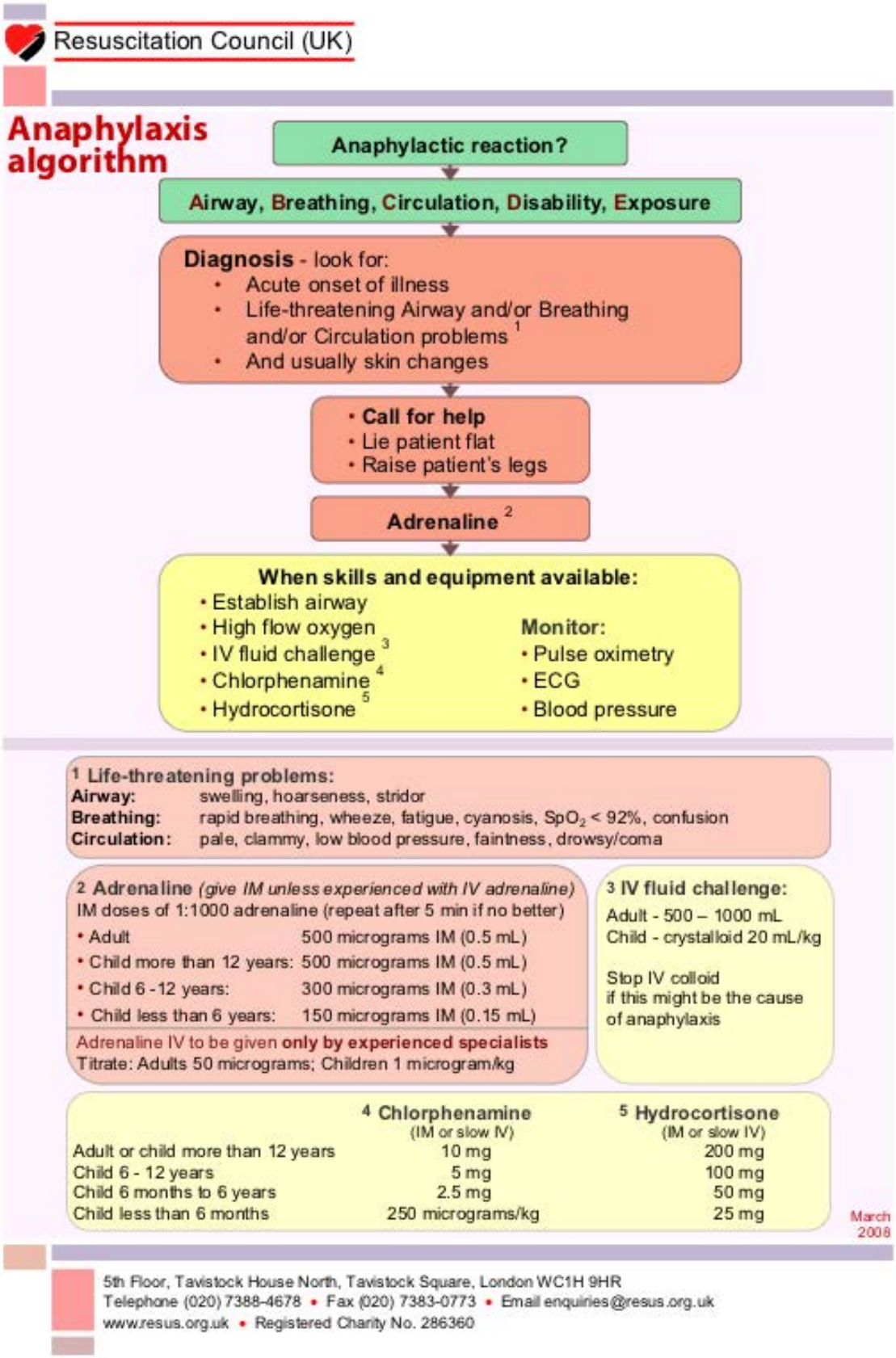
| | |
|---|---|
| **Adenosine** | 6mg, 12mg, 12mg IV |
| **Adrenaline** | Cardiac Arrest: 1mg IV 1:10,000<br>Anaphylaxis: 0.5mg 1:1,000 IM |
| **Alteplase** | Suspected PE during cardiac arrest: 50mg IV bolus<br>(Can consider a further dose of 50mg after 30 mins CPR if no ROSC)<br>Treatment Massive PE: 10mg IV bolus, then 90mg over 2 hours |
| **Amiodarone** | Cardiac Arrest: 300mg after 3rd shock then 150mg after 5th shock<br>Tachyarrythmia: 300mg IV over 10-60 minutes then 900 mg over 24 hours |
| **Aspirin** | 300mg PO (crushed or chewed) |
| **Atropine** | 500mcg IV bolus (can use 600mcg) up to max 3mg |
| **Beta blockers** | Metoprolol 2-5mg IV (at 5min intervals up to 15mg) |
| **Calcium Chloride** | Cardiac Arrest:<br>10mls 10% Calcium Chloride IV rapid injection |
| **Calcium Gluconate** | For treatment of hyperkalaemia:<br>10ml 10% Calcium Gluconate over 3 mins (IV through large vein)<br>Severe hypocalcaemia:<br>10-20mls 10% calcium gluconate in 100ml 5% Dextrose over 10 mins |
| **Digoxin** | Loading dose: 0.75-1mg IV over 2 hours, adjust lower in renal impairment or the elderly<br>(Can give 0.75-1mg orally in divided doses over 24 hours)<br>Caution in hypokalaemia |
| **Flecainide** | 50-100mg PO, reduce by half if also using amiodarone<br>Discuss with cardiology if considering IV<br>(Dose: 2mg/Kg Max 150mg over 30-60 Mins) |
| **Labetalol** | Hypertensive Emergency: 50mg IV over at least 1 min (can be repeated every 5 mins, up to max 200mg) |
| **Magnesium Sulphate** | 2g = 8mmol = 4ml 50% $MgSO_4$ in 100mls N. Saline, rate:<br>• Torsades over 1-2 mins<br>• Severe/life threatening asthma over 20-30 mins<br>• AF over 20-30mins<br>In Eclampsia: IV loading dose of 4g over 10 minutes, followed by an infusion of 1g/hour maintained for 24 hours. |
| **Nitrates** | 400mcg S/L, can be repeated<br>Infusion: GTN 0-10mg/hour of 50mg in 50mls concentration<br>Increase incrementally 0.3-0.6mg steps, keep systolic >90 |
| **Sodium Bicarb** | 50mmol (50ml of an 8.4% solution)<br>DO NOT give simultaneously by the same route as calcium solutions<br>Only for TCA OD or hyperK+ cardiac arrest, in TCA OD: 50ml boluses until acidosis improves or QRS <100ms |
| **Verapamil** | For SVT: 5-10mg over 2 minutes IV with ECG monitoring |

**REF:**
https://www.resus.org.uk/sites/default/files/2020-01/G2015_Adult_ALS.pdf

# ALS: POST-RESUSCITATION CARE




**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_Post-resuscitation-care.pdf

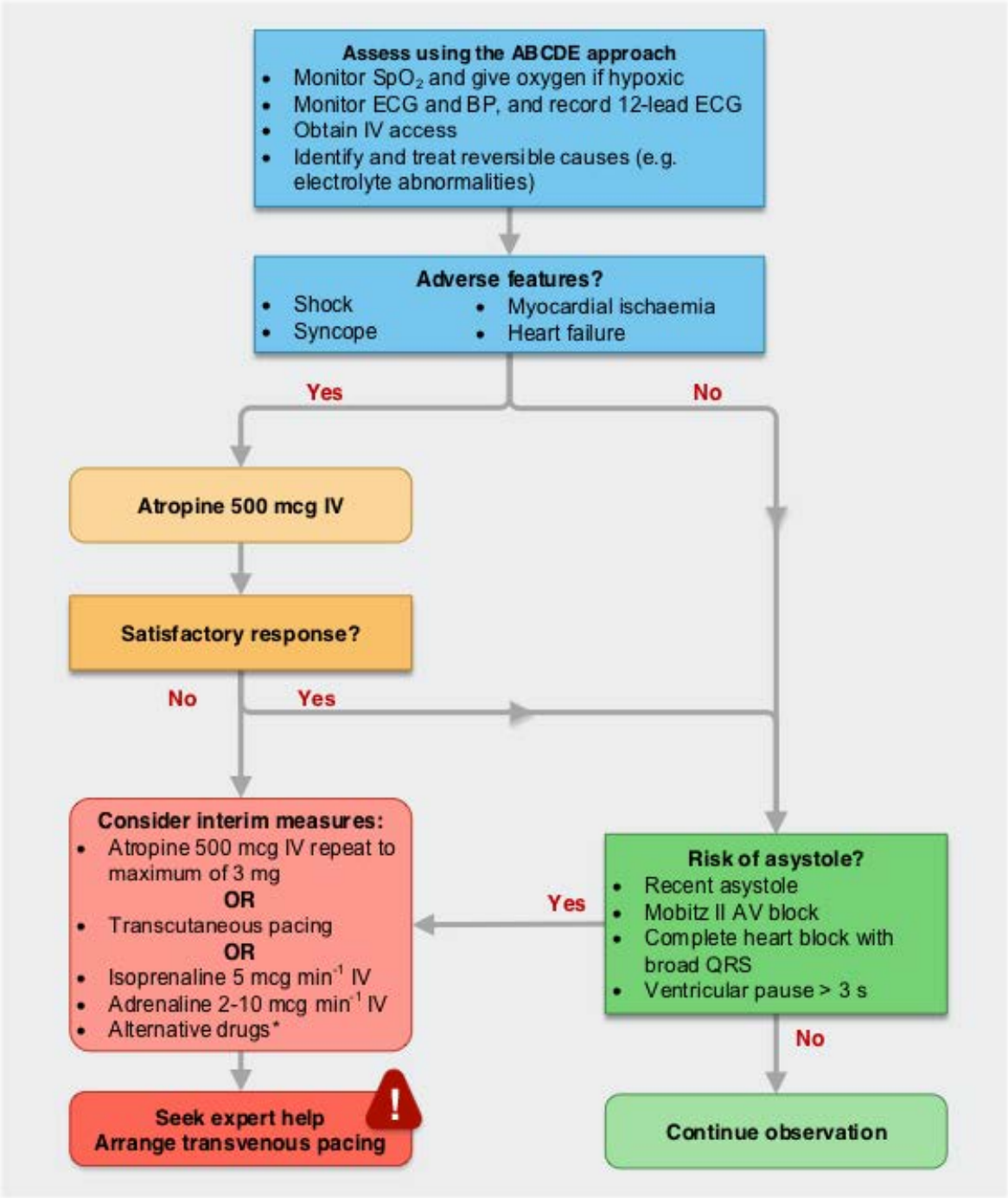



**REF:**
https://www.resus.org.uk/sites/default/files/2020-06/G2010Poster_Anaphylaxis.pdf

# ALS: BRADYCARDIA

Resuscitation Council (UK) GUIDELINES 2015

## Adult Bradycardia Algorithm




*** Alternatives include:**
- Aminophylline
- Dopamine
- Glucagon (if bradycardia is caused by beta-blocker or calcium channel blocker)
- Glycopyrrolate (may be used instead of atropine)

## DRUG DOSES:

**Atropine:** 500mcg IV bolus (max bolus 600mcg) up to max 3mg

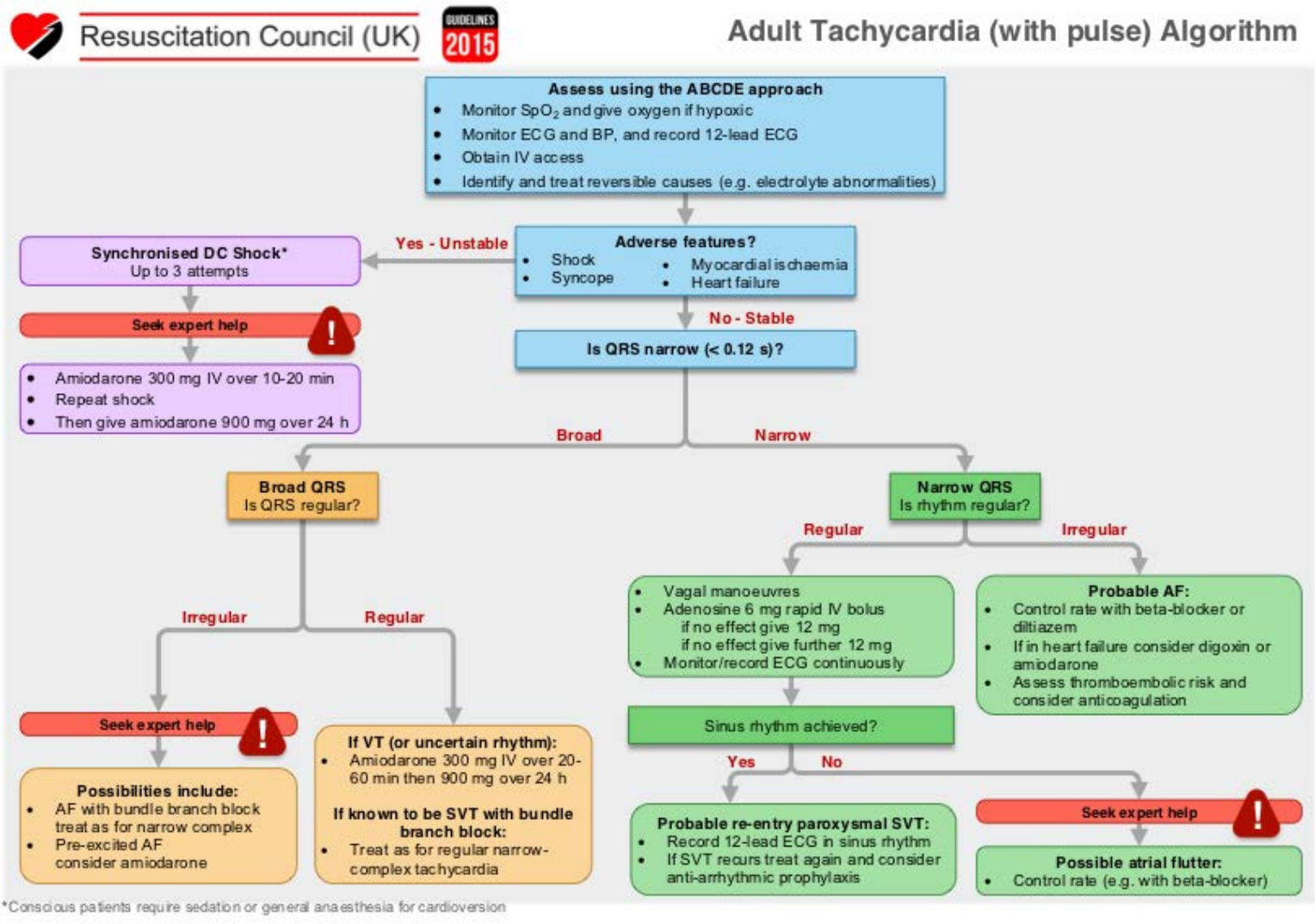
**Isoprenaline:** 1-5mcg/min infusion: 200mcg isoprenaline in 1ml and 1mg in 5ml (1:5000) vials
Add 1mg to 50ml of compatible IV fluid 5% dextrose, Administer at 0-60ml/hr (0-20mcg/min)

**Adrenaline:** 1-10 mcg/min
To make 10mcg/ml whilst awaiting formal infusion: Take 1ml of a 1:10,000 adrenaline minijet and dilute to 10ml with N Saline or, take 1 x 10ml syringe of 1:10,000 adrenaline and inject into a 1litre bag N saline - mark it carefully

**Alternatives:** Aminophylline, Dopamine, Glucagon, Glycopyrrolate

**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_Adult_bradycardia.pdf

# ALS: TACHYCARDIA



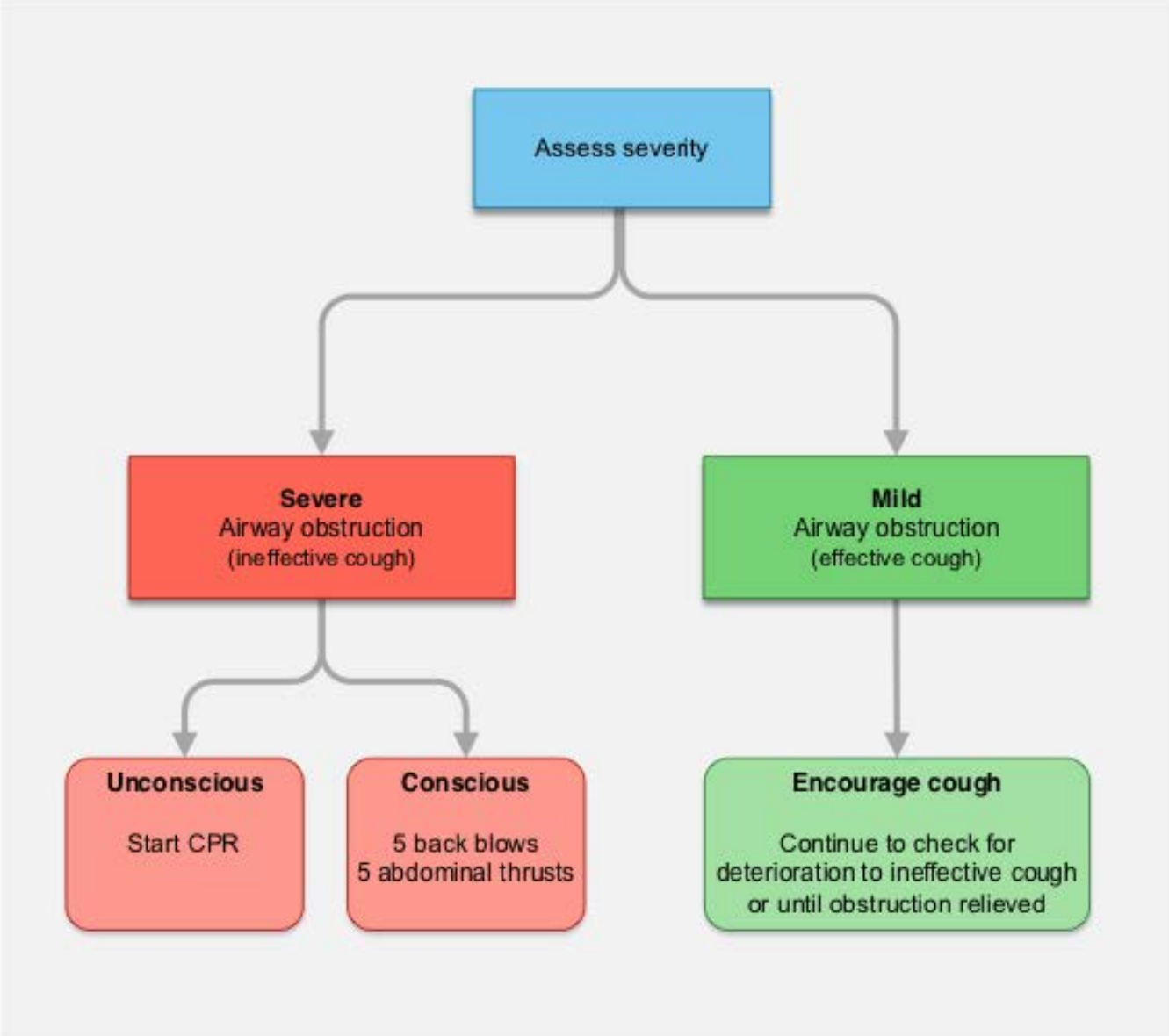

## DRUG DOSES:

**Adenosine:** 6mg, 12mg, 12mg
Contraindications: Asthma, COPD, any arrhythmia involving an accessory pathway (eg WPW)
**Amiodarone:** 300mg over 20-60 mins then 900mg over 24hrs
Contraindications: Acute porphyrias
**B-blockers:** Metoprolol 2-5mg IV Propranolol 100mcg/kg IV
Contraindications: Asthma, COPD, 2nd or 3rd degree heart block, hypotension, CCF
**Digoxin:** 500mcg IV loading dose
Contraindications: Hypercalcaemia, hypokalaemia, hypomagnaesia, , hypoxia
**Flecanide:** 50mg oral or 2mg/kg iv (max 150mg)
Contraindications: Structurally abnormal heart. Use with caution, involve cardiology as can trigger haemodynamic instability
**Verapamil:** 5mg IV
Contraindications: Acute porphyrias, accessory pathway arrythmias

**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_Adult_tachycardia.pdf

Resuscitation Council (UK) GUIDELINES 2015

## Adult Choking

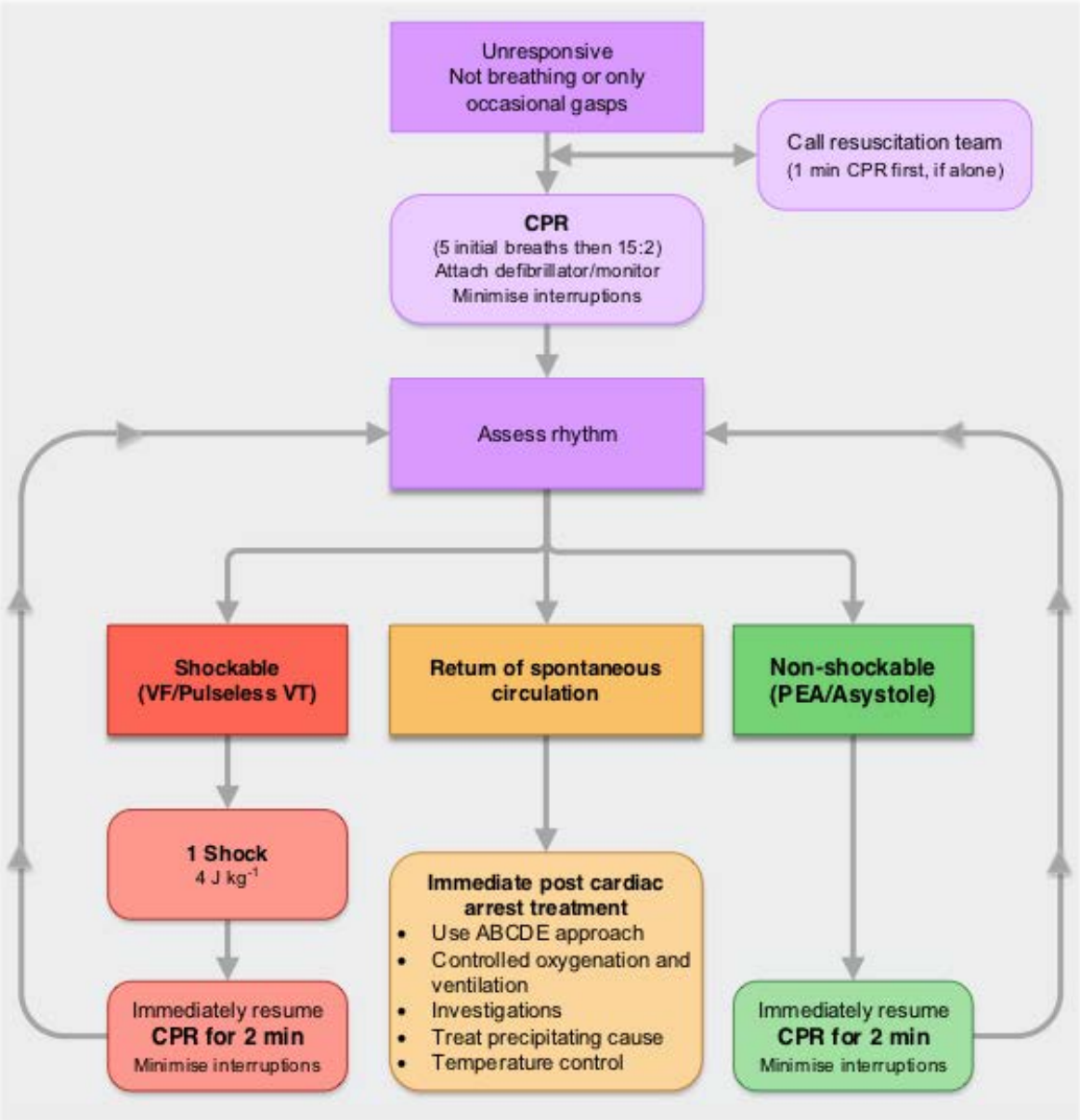



**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_Adult_Choking_Treatment.pdf

# APLS: PAEDIATRIC ALS

Resuscitation Council (UK) GUIDELINES 2015

## Paediatric Advanced Life Support




**During CPR**

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Correct reversible causes
- Consider amiodarone after 3 and 5 shocks

**Reversible Causes**

- Hypoxia
- Hypovolaemia
- Hyper/hypokalaemia, metabolic
- Hypothermia
- Thrombosis (coronary or pulmonary)
- Tension pneumothorax
- Tamponade (cardiac)
- Toxic/therapeutic disturbances

## DRUG DOSES:

SEE NEXT PAGE

**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/Paediatric_ALS.pdf

# Paediatric emergency drug chart

| | | ADRENALINE | FLUID BOLUS | GLUCOSE | SODIUM BICARBONATE | | TRACHEAL TUBE UNCUFFED | TRACHEAL TUBE CUFFED | DEFIBRILLATION |
|---|---|---|---|---|---|---|---|---|---|
| | STRENGTH | 1:10,000 | 0.9% Saline | 10% | 4.2% | 8.4% | | | |
| | DOSE | 10 mcg kg$^{-1}$ | 20 mL kg$^{-1}$ | 2 mL kg$^{-1}$ | 1 mmol kg$^{-1}$ | | | | 4 joules kg$^{-1}$ |
| | ROUTE | IV, IO | IV, IO | IV, IO | IV, IO, | IV, IO | | | Trans-thoracic |
| | NOTES | | Consider warmed fluids | For known hypoglycaemia | | | | Monitor cuff pressure | Monophasic or biphasic |
| AGE | WEIGHT kg | mL | mL | Recheck glucose after dose And repeat as required mL | mL | mL | ID mm | ID mm | Manual |
| <1 month | 3.5 | 0.35 | 70 | 7 | 7 | - | 3.0 | - | 20 |
| 1 month | 4 | 0.4 | 80 | 8 | 8 | - | 3.0 - 3.5 | 3.0 | 20 |
| 3 months | 5 | 0.5 | 100 | 10 | 10 | - | 3.5 | 3.0 | 20 |
| 6 months | 7 | 0.7 | 140 | 14 | - | 7 | 3.5 | 3.0 | 30 |
| 1 year | 10 | 1.0 | 200 | 20 | - | 10 | 4.0 | 3.5 | 40 |
| 2 years | 12 | 1.2 | 240 | 24 | - | 12 | 4.5 | 4.0 | 50 |
| 3 years | 14 | 1.4 | 280 | 28 | - | 14 | 4.5 - 5.0 | 4.0 - 4.5 | 60 |
| 4 years | 16 | 1.6 | 320 | 32 | - | 16 | 5.0 | 4.5 | 60 |
| 5 years | 18 | 1.8 | 360 | 36 | - | 18 | 5.0 - 5.5 | 4.5 - 5.0 | 70 |
| 6 years | 20 | 2.0 | 400 | 40 | - | 20 | 5.5 | 5.0 | 80 |
| 7 years | 23 | 2.3 | 460 | 46 | - | 23 | 5.5 - 6.0 | 5.0 - 5.5 | 100 |
| 8 years | 26 | 2.6 | 500 | 50 | - | 26 | - | 6.0 - 6.5 | 100 |
| 10 years | 30 | 3.0 | 500 | 50 | - | 30 | - | 7.0 | 120 |
| 12 years | 38 | 3.8 | 500 | 50 | - | 38 | - | 7 - 7.5 | 120 |
| 14 years | 40 | 4.0 | 500 | 50 | - | 40 | - | 7 - 8 | 120 - 150 |
| Adolescent | 50kg | 5.0 | 500 | 50 | - | 50 | - | 7 - 8 | 120 - 150 |
| Adult | 70kg | 10.0 | 500 | 50 | - | 50 | - | 7 - 8 | 120 - 150 |

**Cardioversion** **Synchronised Shock** – 1.0 joules kg$^{-1}$ escalating to 2.0 joules kg$^{-1}$ if unsuccessful.

**Amiodarone** 5 mg kg$^{-1}$ IV or IO bolus in arrest (0.1 mL kg$^{-1}$ of 150 mg in 3 mL) after 3rd and 5th shocks. Flush line with 0.9% saline or 5% glucose.

**Atropine** 20 mcg kg$^{-1}$, maximum dose 600 mcg.

**Calcium chloride 10%** 0.2 mL kg$^{-1}$ for hypocalcaemia hyperkalaemia.

**Lorazepam** 100 mcg kg$^{-1}$ IV or IO for treatment of seizures. Can be repeated after 10 min. Maximum single dose 4mg.

**Adenosine** 100 mcg kg$^{-1}$ IV or IO for treatment of SVT. Second dose may be doubled requires large saline flush and ECG monitoring.

**Anaphylaxis** Adrenaline 1:1000 **intramuscularly** (<6 yrs 150 mcg [0.15 mL], 6-12 yrs 300 mcg [0.3 mL], >12 yrs 500 mcg [0.5mL]) can be repeated after five min. (**OR** titrate boluses of 1 mcg kg$^{-1}$ IV **ONLY** if familiar with giving IV adrenaline).

Weights averaged on lean body mass from 50th centile weights for males and females. Drug doses based on Resuscitation Council (UK) Guidelines 2015 recommendations. Recommendations for tracheal tubes are based on full term neonates.

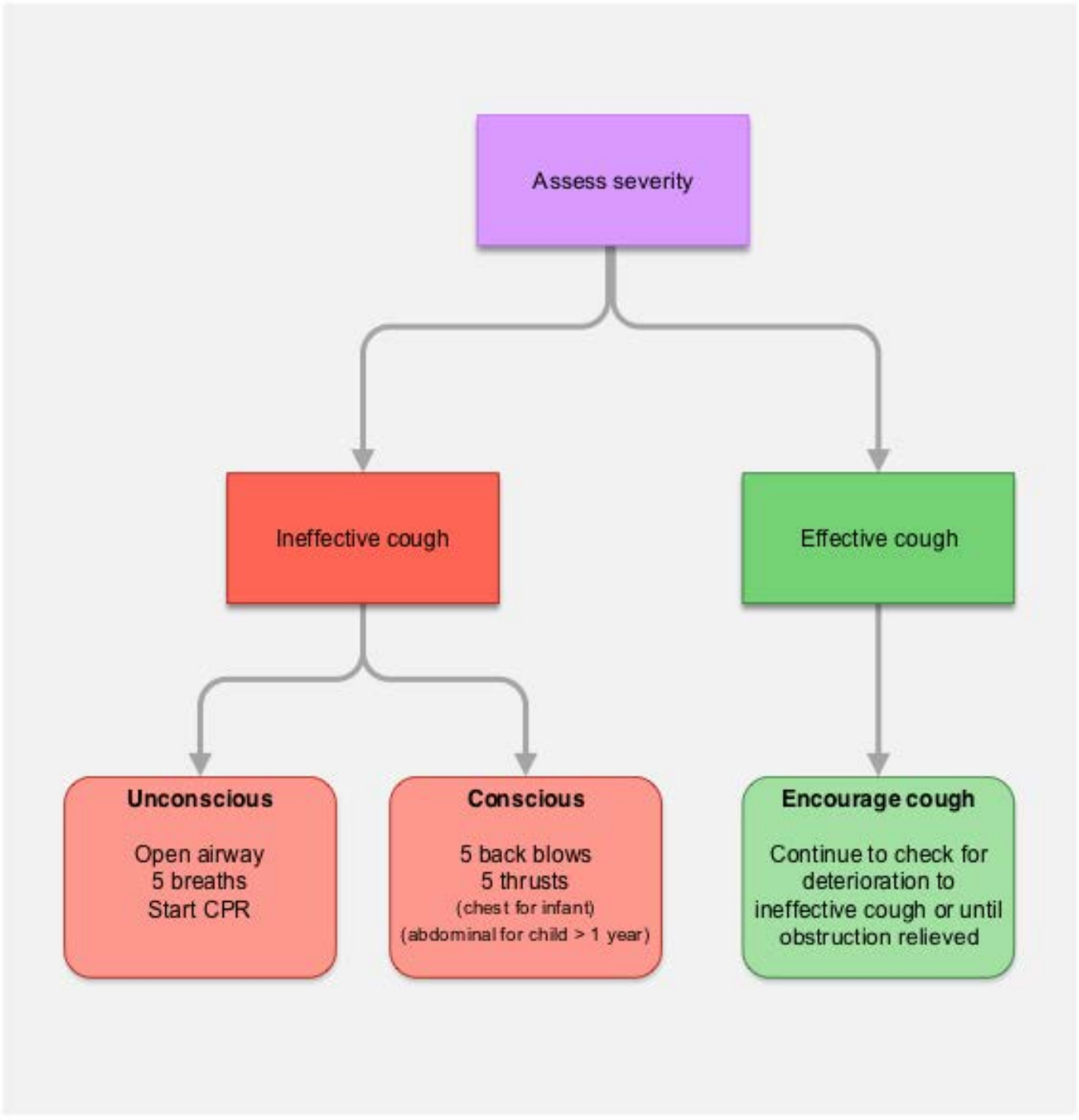
For newborns glucose at 2.5mL kg$^{-1}$ is recommended.

Resuscitation Council (UK)

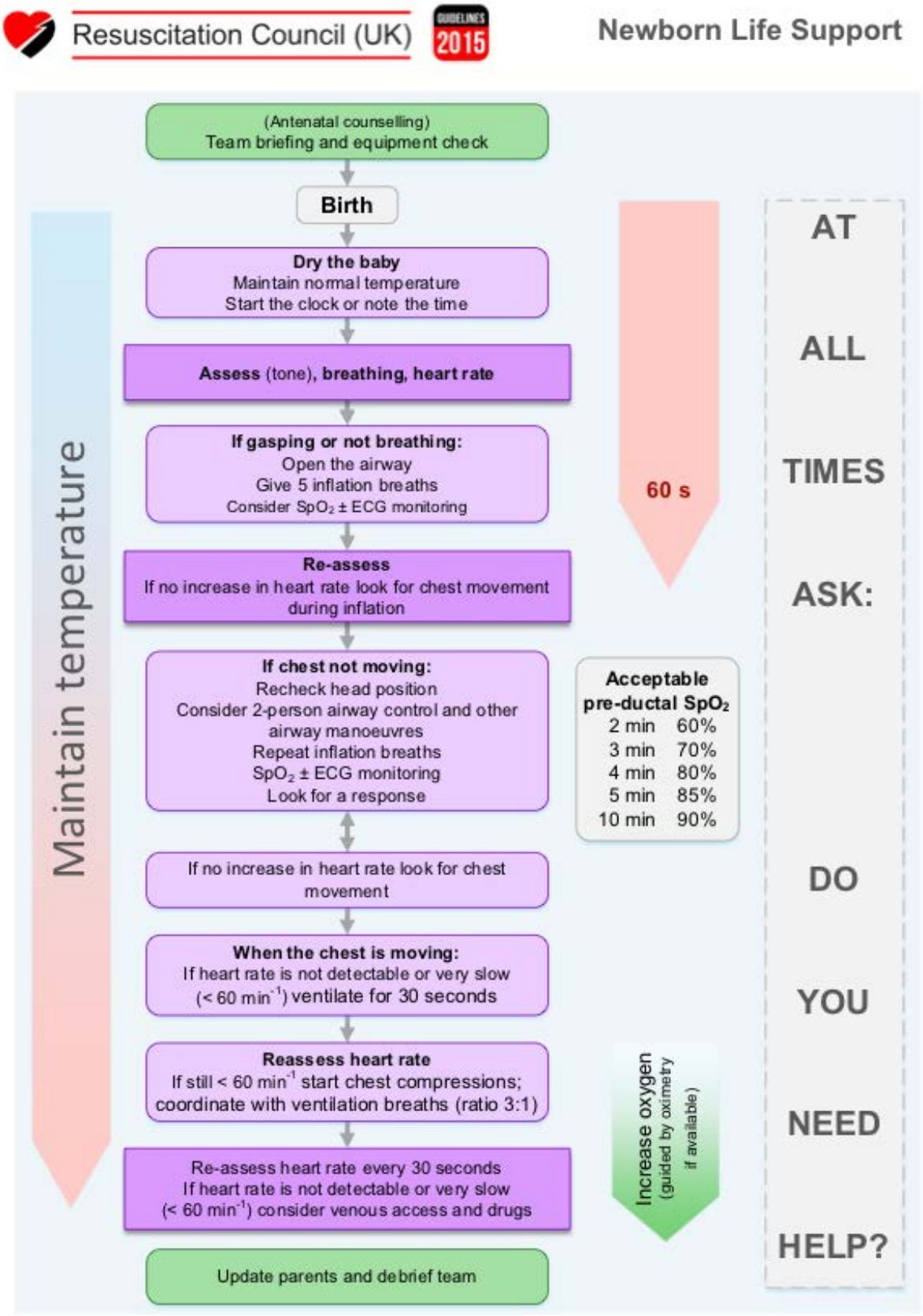
REF: https://www.resus.org.uk/sites/default/files/2020-03/PETchart-18-05-16.pdf

Resuscitation Council (UK) GUIDELINES 2015

## Paediatric Choking




**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_Paediatric_Choking_Treatment.pdf



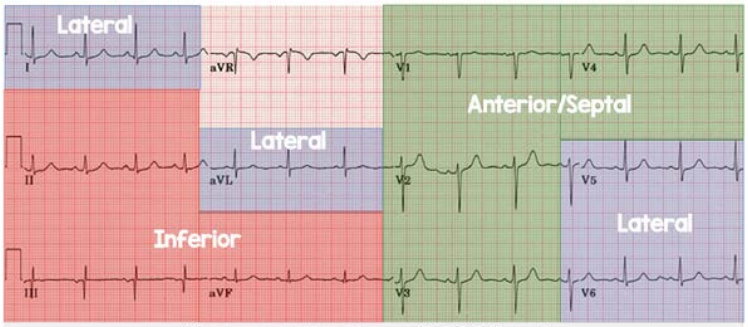

## DRUG DOSES:

via cannula, umbilical vein (preferentially) or IO

Adrenaline 10mcg/Kg (0.1ml/Kg of 1:10,000 solution) If not effective a dose of up to 30mcg/kg may be tried.
Glucose 10% 2.5mls/Kg
N. Saline (0.9%) 10ml/Kg
Sodium bicarbonate 4.2% 2-4mls/Kg.

**REF:**
https://www.resus.org.uk/sites/default/files/2020-05/G2015_NLS.pdf

# ACS: STEMI TERRITORIES




**Coronary Anatomy & ECG Leads**

| | | |
|---|---|---|
| Lateral Leads | I, aVL, V5 - V6 | LCx or Diagonal of LAD |
| Inferior Leads | II, III, aVF | RCA and/or LCx |
| Anterior/Septal Leads | V1 - V4 | LAD |

**Anterior:** Don't miss Wellens waves (deep T inv or biphasic T in V2-3), can disappear with chest pain and reappear once pain resolves but indicate critical LAD occlusion and warrant emergency PCI to prevent progression to STEMI

**Inferior:** Can be associated with RV or posterior infarction
20% develop heart blocks and bradyarrhythmias that are usually transient and respond to atropine

**Posterior:** Associated inferior and lateral STEMI's
Present with ST depression, usually in V1-V3: horizontal ST depression, tall broad R waves, upright T waves, dominant R wave

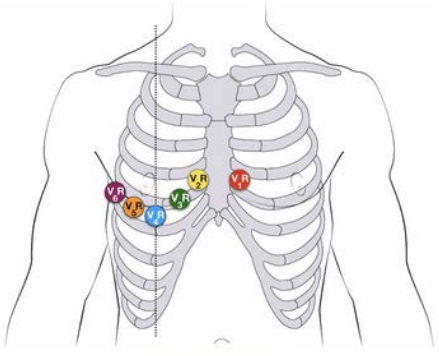
**Right Ventricular:** Up to 40% inferior STEMI's are complicated by a RV infarct
Rt sided MI's can be hard to spot but look for:

- ST elevation V1
- ST elevation in lead III > II
- ST elevation V1>V2
- ST elevation V1 with ST depression V2

Do a Rt sided ECG
RV infarctions require pre-load (avoid nitrates and give 250ml boluses IVF)

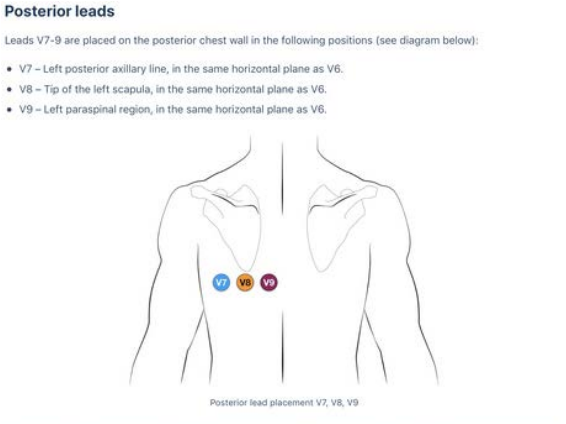
**Lateral:** T Inversion in aVL can be the only initial sign

## RT SIDED ECG:



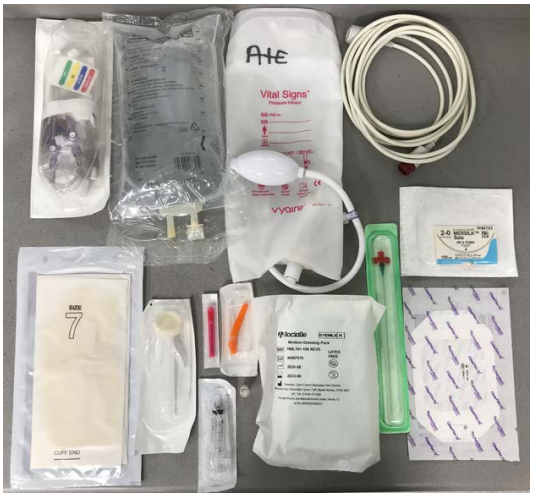
Full right sided 12-lead ECG

## POSTERIOR ECG:




**REF:**
https://rebelem.com/rebel-review/rebel-review-29-coronary-anatomy-ecg-leads/coronary-anatomy-ecg-leads/
https://litfl.com/right-ventricular-infarction-ecg-library/
https://litfl.com/posterior-myocardial-infarction-ecg-library/

# ARTERIAL LINE: INSERTION AND SET UP




**Indications**
Need for invasive BP monitoring
Need frequent blood sampling

**Contra-indications**
No collateral arterial flow (failed Allen's Test)
Overlying skin infection

**Risks**
Bleeding, infection, pain, failure, damage to other structure, distal ischemia if no collateral flow, development of pseudo aneurysms

**Equipment**
Sterile gloves + mask, Local Anaesthetic (+ syringe, drawing up needle and orange needle), Chloroprep, Arterial line, Medium dressing pack: sterile field and sterile gauze, Syringe to take blood if required, Suture, Tegaderm, Prepared transducer (or stopcock if not available)

**Prepare Transducer**
- Open the pressure monitoring set
- Connect to 1L bag N Saline and flush entire line
- Place N Saline in a pressure bag and aim for an automated slow infusion (1-3mL/h) of pressurised saline
- Attach artline cable to pressure monitoring set and monitor

**Procedure**
- Take verbal consent if appropriate
- Find an arterial pulse on either wrist - perform Allens test to confirm radio/ulnar collateral flow
- Wash hands and use sterile gloves
- Clean area with Chloraprep
- Ensure sterile field (consider incopad on the floor under procedure field)
- Un-sheath the art line needle, pierce the skin as if performing an ABG inserting needle into vessel
- Once flashback, hold still and thread the guidewire through (should move freely with no resistance) then remove needle KEEPING HOLD OF THE GUIDEWIRE
- Railroad the arterial line sheath over the guidewire until inserted to hub
- Remove the guidewire, ensure aspirating well (or blood obviously pumping out), take ABG sample +/- blood samples
- Put stopcock on end (or transducer connection if ready) and suture inplace, then once transducer connected cover with Tegaderm

**Calibrate Transducer -** Calibrate ('zeroing') once connected to patient
- Ensure the transducer pressure tubing and flush solution are correctly assembled and free of air bubbles
- Place transducer at level of the right atrium
- 'Off to patient, open to air (atmosphere)'
- Press 'zero' -> sets atmospheric pressure as zero reference point
- Whenever patient position is altered the transducer height should be altered

**REF:**

<table>
<tr><th>Severity</th><th colspan="4">Treatment</th><th>Disposition</th></tr>
<tr><td rowspan="6">Moderate<br>- Increasing symptoms<br>- PEF 51-75% best or predicted<br>- No features of acute severe asthma<br><br>Severe<br>- PEF 33-50% best or predicted<br>- RR ≥25<br>- HR ≥110<br>- Inability to complete sentences in one breath<br><br>Life-threatening = severe asthma + any one of:<br>- PEF < 33% best or predicted<br>- SpO2 < 92%<br>- PaO2 < 8kPa<br>- 'Normal paCO2<br>- Altered conscious level<br>- Exhaustion<br>- Arrhythmia<br>- Hypotension<br>- Cyanosis<br>- Silent chest<br>- Poor respiratory effort<br><br>Near Fatal<br>- Raised paCO2</td><td>Severity</td><td>Mild/Moderate</td><td>Severe</td><td>Life-threatening</td><td rowspan="6">Admit if:<br>- Any features of life-threatening asthma<br>- Any feature of severe asthma present after initial treatment<br><br>May be discharged if:<br>- Able to manage asthma at home and return if required<br>- No features of severe asthma<br>- Peak flow >75% of best or predicted one hour after initial treatment may be discharged from the ED<br><br>D/c with:<br>- Prednisone 40-50mg, minimum 5/7 (or until recovery)<br>- Wheeze Plan<br>- GP follow up recommended within 24 hrs</td></tr>
<tr><td>Immediately</td><td>Salbutamol 4-12 puffs (100mcg/ actuation), via a spacer if needed</td><td>Salbutamol 12 puffs + Ipratropium 8 puffs (21mcg/actuation), via a spacer if needed<br>OR<br>Salbutamol 5mg nebs + add Ipratropium 500mcg to nebulised solution</td><td>Salbutamol 2 x 5mg<br>+ Add Ipratropium 500mcg to nebulised solution<br><br>Call for help: ICU/MET CALL</td></tr>
<tr><td rowspan="3">Within minutes</td><td colspan="3">REASSESS SEVERITY</td></tr>
<tr><td>Rpt dose 20-30 mins or sooner as needed</td><td>Rpt salbutamol dose every 20 minutes or sooner as needed</td><td>Continue continuous salbutamol nebulisation</td></tr>
<tr><td colspan="2">If poor response: Consider IV MgSO4 (2g over 20 mins)</td><td>Start MgSO4 (2g over 20 mins)</td></tr>
<tr><td></td><td>If no improvement or increasing severity call for help and consider additional add ons in consultation with ED senior and ICU support:<br>- IV Salbutamol<br>- IV Aminophyline (NOT if on maintenance therapy):<br>- 250-500mg (max per dose 5mg/Kg) IV over 20 mins,<br>- Followed by an infusion of 500-700mcg/hr/Kg (consider lower dose in the elderly 300mcg/kg/hr)</td></tr>
<tr><td>Within 1st hour</td><td colspan="3">Give steroids: 40-50mg prednisone or if oral route not possible hydrocortisone 100mg IV<br><br>Reassess regularly, reclassifying severity if needed and call for help early if the patient is deteriorating<br><br>Adapted from the: Australian Asthma Handbook https://www.asthmahandbook.org.au/acute-asthma/clinical and BTS/SIGN Asthma Guideline Quick Reference Guide 2019 https://brit-thoracic.org.uk/quality-improvement/guidelines/asthma</td></tr>
</table>

**REF:** See base of table

# ATRIAL FIBRILLATION

**Unstable? ---> move to the ALS algorithm for tachycardia (with pulse)**

Common causes:
Cardiac (e.g. hypertension, valvular heart disease, heart failure, ischaemic heart disease)
Respiratory (e.g. chest infection, lung cancer)
Systemic (e.g. excessive alcohol intake, hyperthyroidism, electrolyte abnormalities, infection, diabetes mellitus)

## If stable:

A-E assessment; look for underlying cause

## Options to reduced heart rate:

- IV Fluid boluses (unless overloaded)
- IV MgSO4 2g over 20-30mins
(if leads to hypotension stop or reduce rate)
- Treat emergent underlying causes; Sepsis, Alcohol withdrawal , Electrolytes abnormalities (Check VBG), Pain/anxiety
- Consider giving regular AF medication if already on treatment
- Consider rate vs rhythm control

Rhythm control
- Consider if reversible cause, onset <48hrs, heart failure caused by AF
- @ the RFH contact cardiology for assistance (2027)

Rate control
- Oral 1st line: Bisoprolol 2.5mg OD or diltiazem 60mg TDS
- 2nd line: Digoxin (500mcg loading dose with rpt at 6-12 hrs if required) then oral maintenance
- IV Metoprolol, Verapamil, Digoxin, Flecainide, Amiodarone (see tachycardia algorithm page for doses and contraindications)
Consider need for anticoagulation

## If suitable for discharge (stable, HR <110) ensure:

Adequate maintenance treatment
Assessment for anticoagulation
Appropriate follow up GP/Cardiology

## @ the RFH :

**For more info on referral and follow up see full RFH AF Guideline**

## ANTICOAGULATION:

Cardioversion:
If no contraindications stat tinzaparin prior to cardioversion (or asap after if emergent)

Upon discharge:
Calculate CHA2DS2-VASc (if >2 in women or >1 in men consider anticoagulation) and HAS-BLED (if >2 consider risks vs benefits of anticoagulation)

Options: Tinzaparin, DOAC, Warfarin

**REF:**
NICE AF guidance
RFH AF Guideline

# BURNS: INITIAL MANAGEMENT SUMMARY

## Burns 1st Aid:

- Run under cool water for 20 mins (still of benefit if burn has occurred within 3 hrs)
- Analgesia (also cover wound to assist with pain relief even if not yet debrided or not ready to apply formal dressing)
- Debride all blisters > 6mm, ensure adequate analgesia first (vital to reduce infection risk but also to delineate burn - may be much bigger than suspected)
- Ensure tetanus up to date (antibiotics only if burn infected - not routine practice)
- Dress with non-adherent dressing with a secondary absorbent layer (e.g gelonet + a layer of gauze)

## Burns Resuscitation

(Follow ATLS/ALS Guidelines if required but key points for burns are summarised below):

A - If suspected Smoke Inhalation or Airway Compromise give oxygen and seek anaesthetic review early, (Consider need for c-spine protection if concurrent trauma)

B - Consider inhalation injury and inhalation of CO or toxins (give 100% o2, if lactate > 7 consider cyanide poisoning)

C - If burns ≥ 15% TBSA in adults or ≥ 10% TBSA in children start fluid resuscitation with Hartmann's as per Parkland Formula:4ml/Kg/% burn. Give ½ over first 8hrs from time of burn, give ½ over 2nd 16hrs. Add additional maintenance fluids if patients NBM. Catheterise and maintain strict fluid balance documentation.

D - Check BM. Consider traumatic injury to head and spine if relevant.

E - Keep patient warm (hypothermia can occur rapidly). If for urgent transfer consider NBM. Perform burns first aid if possible during resuscitation. Look for additional injuries.

Chemical burns with hydrofluoric acid are life threatening to patient regardless of size due to massive leaching of calcium and healthcare providers are at risk of exposure during treatment. Contact Burns immediately for advice.

**FOR MORE IN-DEPTH INFO AND TREATMENT OF SPECIFIC BURNS PLEASE SEE THE LSEBN INFO SHEETS LOCATED IN THE APPENDIX 1 OF THIS DOCUMENT**

## REFERRAL CRITERIA:

Consider if >3% Total Body Surface Area (TBSA) Partial Thickness (PT) burn in adults or >1% TBSA PT in Children.

## Refer all:

Neonatal burns (regardless of size)
All children 'unwell' with a burn (consider Toxic Shock Syndrome)
Burns associated with non accidental injury or safeguarding concerns
Deep dermal and full thickness (FT) burns
Circumferential burns to limbs or trunk or neck
Burns with inhalation injury
Burns associated with electrical shock and chemical burns
Burns to face, hands, perineum, feet
Burns not healed within 2 weeks
Burns with any other injuries
Burns with significant comorbidity or pregnancyInfected burns
Burns with metabolic disturbance
Any other case if clinical concern: IF IN DOUBT, DISCUSS

**CONTACT DETAILS:**

**WWW.TRIPS.NHS.UK**

**CHELSEA & WESTMINSTER HOSPITAL**
**ADULTS 0203 315 2500**
**CHILDREN 0203 315 3706**

**REF:**
Taken from LSEBN Adult Burn Referral Guidelines

# CARDIOVERSION

## Indications
Unstable tachycardia (tachycardia plus shock/syncope/heart failure/MI)

## Equipment
Defibrillator
3 clinicians including 1 qualified to perform sedation
Sedation checklist and equipment, monitoring, drugs

## Procedure
(Can be done by ED but involve anesthetics / ITU if needed)
At least 3 clinicians present - airway/drugs/defib
Place defib pads and defib ECG leads onto the patient
Connect to monitor: ECG, BP (with 1-3min cycle), Sats, and Capnography
Give high flow 02
IV access - IVF prepared incase bolus needed
Sedation: options include fentanyl +/- midazolam OR fentanyl +/- propofol, always use drugs you're familiar with and are appropriate for clinical condition

Cardioversion (can deliver up to 3 synchronised shocks)

1. Turn defib on
2. Select manual mode
3. Confirm
4. Press 'sync' on the defib machine (sync will appear before the number of joules)
5. Set voltage to 120 joules (reduced by pressing downward arrow)
6. Deliver synchronised shock - remember to keep pressing until shock delivery, it may take a couple of seconds as the machine has to find the right time to deliver the shock
7. If fails give 2nd shock 150J, 3rd shock 200J - if no effect involve cardiology and consider 300mg amiodarone over 10-20mins with repeat shock after amiodarone

Get 12 lead ECG post procedure


**REF:**
Advanced Life Support Manual 7th Edition Nov 2015 Resuscitation Council (UK)

# CENTRAL LINE INSERTION

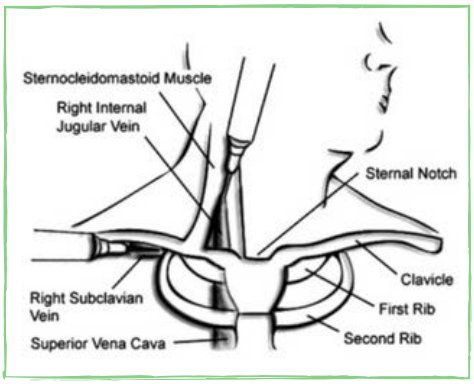
## Indications
Central access required for blood, fluids, electrolytes, inotropes
If large volume resuscitation required consider vascath insertion

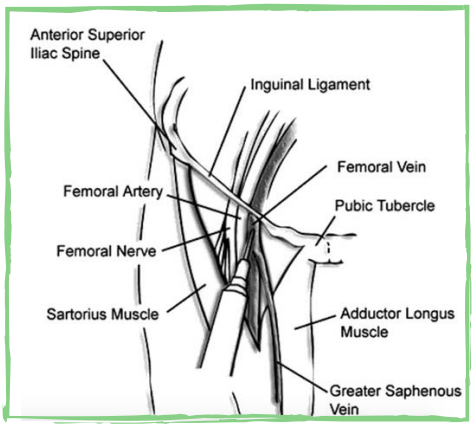
## Contraindications
Significant coagulopathy, raised ICP

## Risks
Haemothorax, haematoma, pneumothorax, infection

## Equipment
Ultrasound Machine + Central line seldinger kit + Mask + Sterile Gloves
Lignocaine + N. Saline (50ml bag or several 10ml flushes)
4 x bungs, Scalpel, Suture
Royal Free Hospital Central Line Pack includes the following:

- 1 x 5ml syringe + drawing up needle
- Green and orange needle
- 1 x 20ml and 1 x 10ml syringes
- Chlorprep
- Sterile field + drape
- Gown + hand towel
- Ultrasound sterile probe cover + Sterile US gel
- Opsite




## Pre-procedure
Consent
Put head down (if patient able to tolerate)
Ensure helpful assistant
Flush lines with saline and close all ports except brown port
Identify location: Internal jugular vein, subclavian vein, femoral vein

## Procedure
Identify the vein
Attach seldinger needle to syringe and insert into vein
When aspirating freely, take syringe off and pass guidewire into vein (watch monitor in case wire advances too far and causes arrhythmia)
Remove needle KEEPING HOLD OF THE GUIDEWIRE
Make a small skin incision with the scalpel to allow the dilator to enter skin
Pass the dilator over the needle then remove (once dilator removed it will cause some bleeding)
Pass the central line over the guidewire and once inserted take out the guidewire and flush all ports
Add infusion lines or bungs to each lumen
Draw VBG to confirm venous placement
Suture in place and cover with opsite

**Post procedure** XR to check line placement

**REF:**
Advanced Life Support Manual 7th Edition Nov 2015 Resuscitation Council (UK)
A review in emergency central venous catheterization, Osaree Akaraborworn, Chinese Journal of TraumatologyVolume 20, Issue 3, June 2017, Pages 137-140 https://www.sciencedirect.com/science/article/pii/S1008127516301596

# CHEST DRAIN INSERTION (SELDINGER)

**Indications for a seldinger chest drain:**
Pneumothorax
- Check BTS criteria, is it amenable to conservative management or aspiration
Effusions

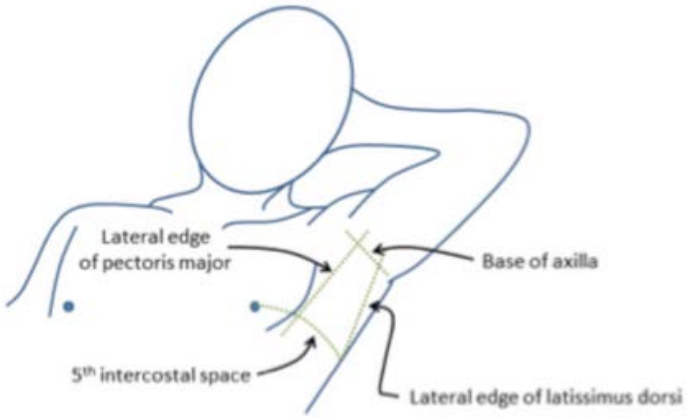
**Pre procedure checklist:**
Move patient to Resus
Check observations stable, ensure monitoring in situ and good IV access
Confirm indication - would aspiration suffice?
Does it need to be done now? (in-hours better than out of hours)
Is there a skilled operator or do you need help?
Confirm side - check imaging/bed side US
Check coagulation status
Written consent
Adequate analgesia - consider ketamine for sedation (in which case follow sedation protocol and ensure adequate staff present)

**Equipment:**
Chloraprep, drapes, lignocaine, sample bottles if an effusion (biochem, cytology, MC and S), sutures with curved needle, drain bottle **with water added**, seldinger kit, an assistant

**Procedure:**
- Confirm location in safe triangle
- Aseptic technique/clean/drape/PPE
- Lignocaine - 10mls 1-2% +/- IV analgesia or 0.5mg/kg ketamine
- Confirm aspiration of fluid/air
- Small incision with scalpel, introduce needle and aspirate until in pleural cavity
- Feed guide wire through, no further than 30cm, secure wire at all times and remove the introducer
- Insert dilator over guide wire, remove dilator and put drain sheath over the guide wire up to 12-14cm then remove guide wire
- If an effusion attach 3-way tap and take samples
- Attach drain to underwater seal and secure with suture, clear tegaderm dressing over insertion site and additional tape mesentery at distal drain, check drain swinging (and bubbling in pneumothorax)

**Post procedure:**
CXR, observations, drain swinging/bubbling, any blood?
Write up notes and handover to admitting specially, ensure regular analgesia written up

## SAFE TRIANGLE:




Safe triangle for chest drain insertion

**REF:**
https://www.oxfordmedicaleducation.com/clinical-skills/procedures/intercostal-drain/

# CHEST DRAIN INSERTION (TRAUMA)

**Indications for a trauma chest drain:**
Moderate or large pneumothorax (in the context of trauma)
Visible Haemothroax on CXR
Combined Haemopneumothorax

**Pre procedure checklist:**
Move patient to Resus, consider trauma call
Continue resuscitation, ensure monitoring in situ, good IV access and consider need for blood
Confirm indication - some smaller heamo/pneumthoraces can be managed conservatively if in doubt discuss with consultant in charge or MTC
Is there a skilled operator or do you need help?
Confirm side - check imaging/bed side US
Check coagulation status - do you need to reverse anticoagulation
Consent
Adequate analgesia - lignocaine and consider ketamine for sedation (in which case follow sedation protocol and ensure adequate staff present)

**Equipment:**
Chloraprep, Surgical Gloves, Lignocaine,
Chest drain kit: Gauze, 10 blade scalpel, blunt forceps, suture,
Chest drain (28-40),
Tape and dressings for securing drapes,
Drain bottle **with water added**, An assistant

**Procedure (see pictures overleaf):**

- Confirm location in safe triangle:

5th intercostal space, just anterior to the mid axillary line

- Aseptic technique/clean/drape/PPE
- Lignocaine +/- analgesia +/- 0.5mg/kg ketamine
- Clamp proximal chest drain

(to stop fluid flowing out during insertion)

- Make 2-3cm incision along upper rib margin
- Blunt dissect through subcutaneous tissue

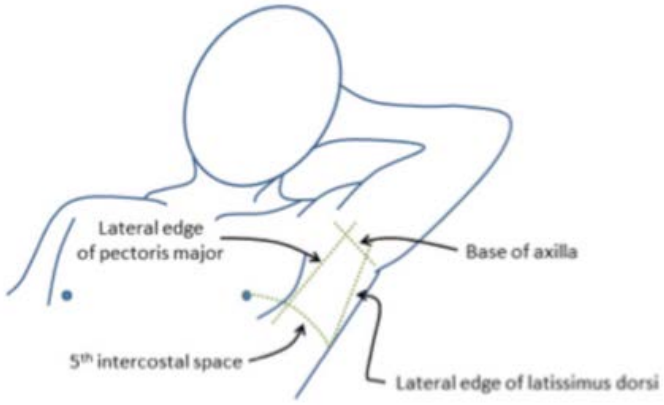
over upper rib border until in pleural cavity

- Perform finger thoracostomy
- Feed forceps into tip of drain and advance

drain into pleural space until all drain holes are intrathoracic

- Attach drain to underwater seal and release

the clamp, secure with suture, clear tegaderm dressing over insertion site and additional tape mesentery at distal drain, check drain swinging (and bubbling in pneumothorax)

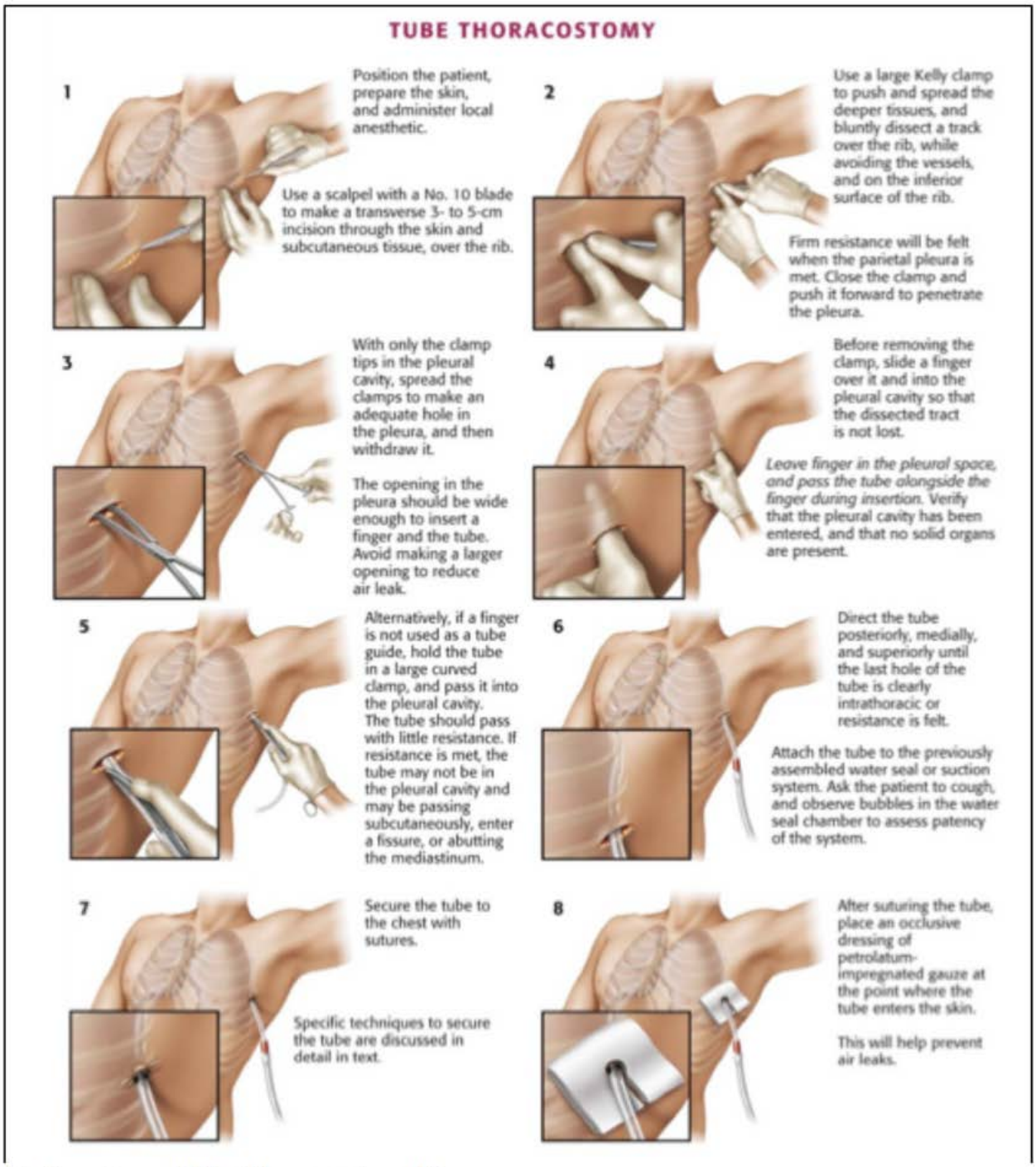


Safe triangle for chest drain insertion

**Post procedure:**
CXR, observations, drain swinging/bubbling, any blood?
Write up notes and handover to admitting specially, ensure regular analgesia written up

**Massive Haemothorax:**
Defined as >1500ml or 200ml/hr for 2hrs
Contact cardiothoracics/theatre and continue transfusion

**REF:**
https://www.oxfordmedicaleducation.com/clinical-skills/procedures/intercostal-drain/
http://www.emdocs.net/wp-content/uploads/2016/09/Screen-Shot-2016-09-23-at-4.15.51-AM.png




Performing a Tube Thoracostomy[15]

**REF:**

https://www.oxfordmedicaleducation.com/clinical-skills/procedures/intercostal-drain/

http://www.emdocs.net/wp-content/uploads/2016/09/Screen-Shot-2016-09-23-at-4.15.51-AM.png

## Failed intubation, failed oxygenation in the paralysed, anaesthetised patient

DIFFICULT AIRWAY SOCIETY DAS 2015

**CALL FOR HELP**

↓ Continue 100% $O_2$
Declare CICO

**Plan D:** Emergency front of neck access

Continue to give oxygen via upper airway
Ensure neuromuscular blockade
Position patient to extend neck

### Scalpel cricothyroidotomy

**Equipment:** 1. Scalpel (number 10 blade)
2. Bougie
3. Tube (cuffed 6.0mm ID)

**Laryngeal handshake to identify cricothyroid membrane**

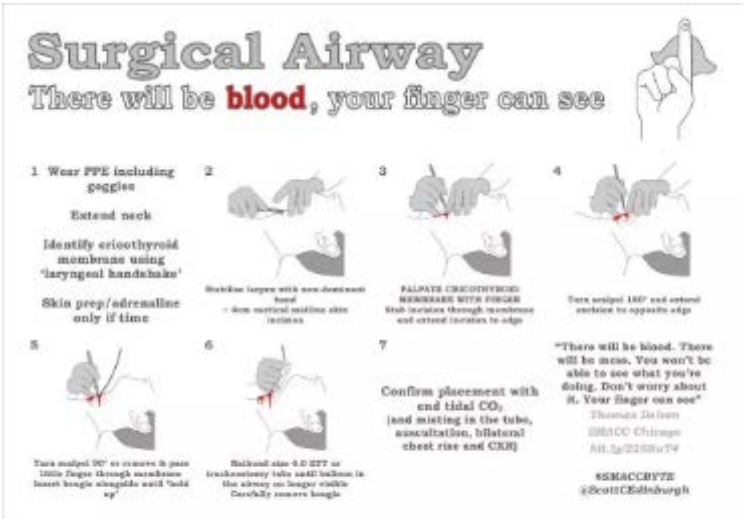
**Palpable cricothyroid membrane**
- Transverse stab incision through cricothyroid membrane
- Turn blade through 90° (sharp edge caudally)
- Slide coude tip of bougie along blade into trachea
- Railroad lubricated 6.0mm cuffed tracheal tube into trachea
- Ventilate, inflate cuff and confirm position with capnography
- Secure tube

**Impalpable cricothyroid membrane**
- Make an 8-10cm vertical skin incision, caudad to cephalad
- Use blunt dissection with fingers of both hands to separate tissues
- Identify and stabilise the larynx
- Proceed with technique for palpable cricothyroid membrane as above

**Post-operative care and follow up**
- Postpone surgery unless immediately life threatening
- Urgent surgical review of cricothyroidotomy site
- Document and follow up as in main flow chart

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

## PLAY BY PLAY:




**Cric SMACC bite**

First10EM / Justin Morgenstern

**REF:**
https://das.uk.com/files/das2015intubation_guidelines.pdf
https://first10em.com/cricothyroidotomy/cric-smacc-bite/

# STAGES OF LABOUR

**Remember**

**Braxton Hicks Contactions**
No more than 1 or 2 per hour
Irregular and not increasing in intensity or frequency
Resolve with Ambulation or Change in Activity

**STAGE ONE**

**Begins with regular contractions**
Progressively more rhythmic, longer and stronger
Typically every 10-15mins increasing to every 2-3mins
Cervix will efface (shorten) and dilate to 10cm

**CAN TRANSFER THESE LADIES TO MATERNITY UNIT**

**STAGE TWO**

**Starts at full dilatation and ends with delivery of baby**
Usually heralded by a strong urge to push

**IF VERTEX VISIBLE - PREPARE TO DELIVER IN DEPARTMENT**

**STAGE THREE**

**Delivery of Placenta**
Usually within 5-10mins but can take up to an hour
Generally allow to happen spontaneously
Don't pull on cord unless delivering actively

# NORMAL LABOUR

**Equipment**

'Delivery Tray + Pack'
Clean sheets & Warm Towels
Inco pads & Sanitary Pads
Apron
Gloves
Cord Clamp & Scissors
Resuscitaire (turn on)
Hat for Baby

**Indications**

**DELIVERY IN EMERGENCY DEPARTMENT**
If head is visible and patient has a strong urge to push (2nd stage)
Particularly if parous (previous children)
**If not - transfer to maternity unit**

**Remember**

The vast majority are normal spontaneous births
Usually very little to do actively - support baby coming naturally
Keep mother calm - lots of reassurance
Push with contractions
Can use Entonox if required

**2nd Stage**

Place clean sheets and inco pads around mum
Use sanitary pad to cover anus and wipe away stool
Use thumb and index finger to support perineum
Allow head to delivery spontaneously (usually face towards mothers back)
When head delivered it will rotate 90º (face mothers leg)
Place hands gently on each side of baby's head to support
At next contraction use gentle traction downwards to release anterior shoulder
Then gentle traction upwards to release posterior shoulder
Rest of baby should pop out easily
Place on towel on top of mum

**Baby**

Dry vigorously
Delay clamping of cord for 2 mins or until stops pulsating
Place hat on baby head
Wrap in clean warm towel
Give to mother

**3rd Stage**

**Physiological Labour**
Allow to come spontaneously
Mother may have urge to push
Can take up to an hour
Aided by skin contact and nuzzling at breast

**Active Labour**
Give 10IU IM Syntocinon
Gentle traction on cord
Hand pressing suprapubically to prevent uterine inversion
When placenta delivered twist it to form a membrane 'cord'

GRI ED 2017

**REF:**
https://stmungos-ed.com/obstetrics/normal-labour

# DIABETIC KETOACIDOSIS

## Diagnosis

Lack of insulin leading to:

- Blood ketones > 3
- Urinary ketones > 2+
- Glucose >11PH <7.3 HCO3 <18 and /or BE >-10

## Management

VBG, bloods, CXR, urine dip, BHCG, cultures if pyrexial, ECG
2 x IV access
IV fluids: 1st bag 0.9% Saline over 1 hour
Fixed rate insulin 0.1 units/kg/hour (make up 50 units actrapid in 50mls normal saline - max dose 15 units/hour)
Continue long acting insulin (but stop any automated pumps)
Hourly VBG and ketones, 4-hourly U and E
Early discussion with ITU if concerns
CT head if ?cerebral oedema
Thromboprophylaxis

## Fluid

**Systolic BP <90** - 500ml bolus normal saline 0.9%, repeat if remains hypotensive
Then 1 litre normal saline over 1 hour
Consider K+ replacement as below, if BM <15 start 10% dextrose 125ml/hr
**Systolic BP>90** - 1 litre normal saline 0.9% over 1 hour

## K+

> 6.5 Give 10 units actrapid in 50mls 50% dextrose plus 10mls 10% calcium gluconate
5.5-6.4 - no action
3.5-5.4 - 40 mmols K+ over 4 hours
<3.5 start 40 mmols K+ but consider central line to give 20 mmols/hour

## TREATMENT AIMS:

Glucose fall 3-5mol/hr
Ketone fall 0.5mmol/hr
HCO3- rise 3mmol/hr
K+ remain 4 - 5.5
If mixed DKA/HHS (osmolality >320) aim osmolality fall 3-5 mosm/kg/hr

## CONSIDERATION FOR ICU:

Blood ketones > 6mmol/L, Bicarb < 5mmol/L, pH < 7.0, K+ < 3.5mmol/L, GCS < 12 O2 sats < 92% on air (assuming normal baseline respiratory function) Systolic BP< 90mmHg, Elderly, Pregnant, Heart or kidney failure, Other serious co-morbidities

**REF:**
Joint British Diabetes Societies Inpatient Care GroupThe Management of Diabetic Ketoacidosis in Adults. 2nd Edition, Update: September 2013, https://www.diabetes.org.uk/resources-s3/2017-09/Management-of-DKA-241013.pdf

# DRUG ASSISTED INTUBATION

## PRE-ASSESS
LEMON + Mallampati
Is this going to a predicted difficult airway?
    Consider marking cricothyroid, get difficult airway kit
Do you need more senior support?

## POSITION
Head up, ramped, sniffing the morning air
If trauma - do you need MILS?

## PHYSIOLOGICAL OPTIMISATION
Reverse Hypovolaemia/Hypotension:
    Fluids running or primed,
    Consider metaraminol and noradrenaline/adrenaline support
Pre-oxygenate: waters circuit + nasal cannula

## MONITORING
ECG, O2 sats, Capnography, BP - 1-3 min cycles (consider arterial line)

## EQUIPMENT
Oxygen, suction, OPA, NPA, LMA, Laryngoscope, ETT x 2, lube, bougie, 10ml syringe, tube tie, scalpel

## DRUGS
IV access x 2
Standard DAI drugs (see below)
Emergency drugs (see below)
Post intubation sedation:
    Propofol 1% (10mg/ml), fill 50ml syringe and put through syringe driver at rate 10ml/hr - adjust accordingly

## TEAM BRIEF
Verbalise plan A, B and C
Team questions/concerns
Locate difficult airway trolley

## DRUG ASSISTED INTUBATION OPTIONS:
1:1:1 - Fentanyl 1mcg/Kg, Ketamine 1-2mg/Kg, Rocuronium 1mg/Kg
Analgesia: Fentanyl 1mcg/kg
Induction: Ketamine 1-2mg/kg, Propofol 50-200mg IV
Paralysis: Rocuronium 1mg/kg

## EMERGENCY DRUGS:
Metaraminol 0.5-1mg bolus (make up 0.5mg/ml solution in 10ml syringe),
Ephedrine 3mg IV boluses (30mg in 10mls therefore 3mg = 1mll)
Atropine 0.5mg bolus

## COMPLICATIONS:
Laryngospasm: 02, BVM with PEEP, deepen sedation/proceed with RSI
Hypotension: usually transient, fluid bolus/metaraminol
Bradycardia: atropine 500-600mcg bolus

**REF:**

## ROYAL COLLEGE OF ANAESTHETICS: ANAESTHETIC DRUG CRIB SHEET

# Basic Anaesthetic Drugs

**Doses are for an average adult. They are provided as a guide to the usual range of doses for fit ASA1/2 adult patients only.**

**You should discuss these doses with your trainers and adjust the document as required according to local practice.**

***= Titrate to effect.**

| Induction Agents | Dose | Presentation |
|---|---|---|
| Propofol | 2–3 mg/kg | 10 mg/ml |
| Thiopental | 3–5 mg/kg | 25 mg/ml – Beware of antibiotics in 20 ml syringe |

| Opioids | Dose | Presentation |
|---|---|---|
| Fentanyl* | 1 mcg/kg | 50 mcg/ml |
| Alfentanil* | 10 mcg/kg | 500 mcg/ml |
| Morphine* | 0.1 mg/kg | 10 mg/ml |

| Muscle Relaxants | Dose (Intubation) | Top ups | Presentation |
|---|---|---|---|
| Atracurium | 0.5 mg/kg | Approximately half intubating dose | 10 mg/ml (stored in fridge) |
| Vecuronium | 0.1 mg/kg | | 2 mg/ml |
| Rocuronium | 0.6 mg/kg | | 10 mg/ml (stored in fridge) |
| Suxamethonium | 1–1.5 mg/kg | | 50 mg/ml (stored in fridge) |

| Reversal for muscle relaxants | Neostigmine 2.5 mg + Glycopyrronium 500 mcg |
|---|---|

| Local Anaesthetics | Toxic Dose | Formulation/Max Dose |
|---|---|---|
| Bupivacaine | 2 mg/kg | 0.25% = 2.5 mg/ml (Max dose 0.8 ml/kg)<br>0.5% = 5 mg/ml (Max dose 0.4 ml/kg) |
| Lidocaine | 3 mg/kg without adrenaline<br>6 mg/kg with adrenaline | 1% = 10 mg/ml<br>2% = 20 mg/ml |

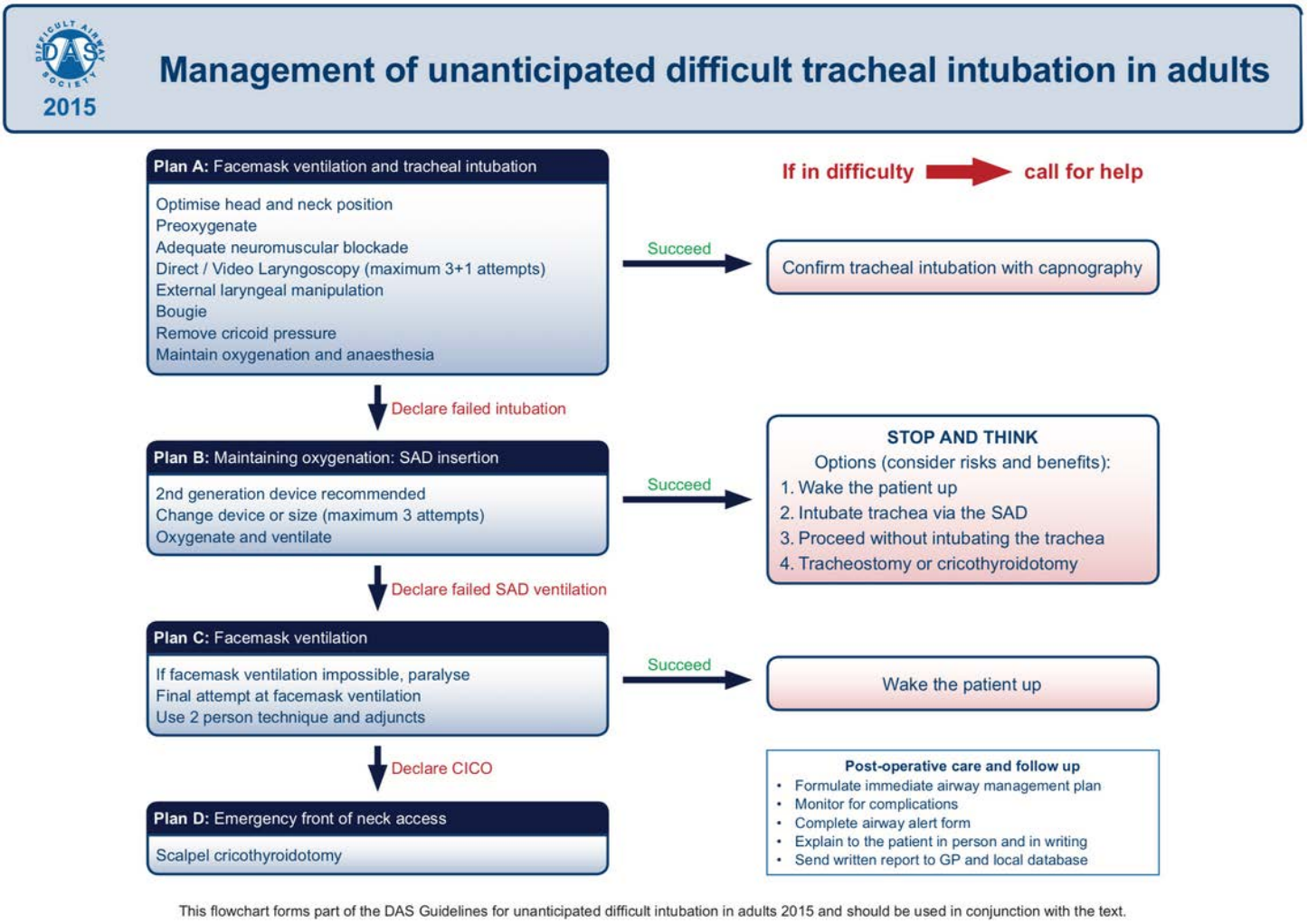
| Common Emergency Drugs | Use | Dose | Presentation |
|---|---|---|---|
| Suxamethonium | Laryngospasm | 25–50 mg | 50 mg/ml (fridge) |
| Atropine* | Bradycardia | 20 mcg/kg | 1 mg/ml |
| Glycopyrronium* | Bradycardia | 200 mcg bolus | 200 mcg/ml |
| Ephedrine* | Hypotension | 3 mg bolus | 30 mg diluted into 10 ml saline |
| Metaraminol* | Hypotension | 0.5 mg bolus | 10 mg diluted into 20 ml saline |

| Adrenaline* | Suspected anaphylaxis | 50–100 mcg boluses titrated to effect<br>0.5–1 ml of 1:10,000 |
|---|---|---|

| Other Emergency Drugs | |
|---|---|
| Intralipid 20% | Local anaesthetic toxicity – initial dose 1.5 ml/kg IV over 1 min |
| Dantrolene | Malignant Hyperthermia – initial dose 2.5 mg/kg IV (9 vials for 70 kg Px) |

**REF:**
https://rcoa.ac.uk/sites/default/files/documents/2019-11/ANAESTHETIC_DRUG_CRIB_SHEET-8.pdf

# DRUG ASSISTED INTUBATION: UNANTICPIATED DIFFICULT INTUBATION




## IF MORE ANASTHETIC HELP NEEDED EMERGENTLY:

Call 2222 and ask for an 'anaesthetic emergency call'

**REF:**
https://das.uk.com/files/das2015intubation_guidelines.pdf

# DRUG ASSISTED INTUBATION: SETTING UP THE VENTILATOR

Machine usually in standby mode, precalibrated - if not follow calibration instructions on screen prior to starting, then:

**Press 'Adult/Ped'** to input new patient details

Both Paediatric and Adult patients can use the same tubing (Paed-Adult tubing) - just dial down the height
For neonates or infants under 20kg use separate neonatal tubing, once attached a different tab will open and the neonatal settings can be opened

**Press 'Modes'** and select required mode (usually ASV mode as it allows patient to take a breath whilst ventilator augments their own 'performance'. Combines both pressure and volume control.)

**Choose MALE or FEMALE**

- To select either touch screen or turn green dial and then press the dial to confirm

**Input height in cm** (use a tape measure to check height should be hanging up)

- Use dial to select, alter and then confirm height input
- Machine will calculate the ideal body weight and therefore the tidal volume (6-8mls/kg)

**Initial settings:**

- Fi02 100% (and then wean down as able)
- PEEP 5 (and increased as per ARDSNet)
- Use dial to select, alter and the confirm each input

**Press START**

**REF:**

## Management of IMMINENT ECLAMPSIA or ECLAMPSIA

**DO NOT LEAVE PATIENT ALONE**

Place in semi-prone position

**Call for HELP** – Duty obstetric & anaesthetic registrars; senior midwife
Inform consultants – obstetrician and anaesthetist on-call

**OBSERVATIONS**
Pulse Oximeter BP
Respirations Temperature
ECG
Test urine for protein
Hourly urine output
Fluid balance / MEOWS chart
FH – monitor continuously

**AIRWAY**
- Assess; consider left lateral tilt
- Protect Airway and maintain patency
- Give oxygen

**BREATHING**
- Assess
- Ventilate as required

**CIRCULATION**
- Evaluate pulse & BP
- If absent, start CPR: 30 compressions/2 breaths
- Call ARREST TEAM
- Secure IV access as soon as safely possible

**INVESTIGATIONS**
FBP & Platelets
U&E
Urate
Serum Creatinine
LFTs
Coagulation Screen
Group and Hold Serum
MSSU/CSU
24 hr urine collections for:
- Total protein & creatinine clearance
- Catecholamines

**CONTROL SEIZURES**
- **Loading dose $MgSO_4$:** 4 g $MgSO_4$ in 20% solution IV over 10-15 minutes
  Add 8ml of 50% $MgSO_4$ solution to 12 ml N Saline
- **Maintenance dose $MgSO_4$:** 1g per hour infusion
  Add 25g MgSO4 (50 ml) to 250 ml N Saline
  1g $MgSO_4$ = 12 ml per hour IV
- **If seizures continue/recur:** $MgSO_4$ 2g ≤ 70kg; 4g ≥ 70kg IV as per loading dose over 5-10 minutes.
- **Monitor:** Hourly urine output
  Respiratory rate, $O_2$ saturation & patellar reflexes – every 10 minutes for first 2 hours and then every 30 minutes
  Check serum magnesium levels daily if infusion is continued for >24 hours
- **Stop Infusion:** Check magnesium levels and review management with consultant if:
  Urine output < 100ml in 4 hours
  or if: Patellar reflexes are absent
  or if: Respiratory rate < 16 breaths/minute
  or if: Oxygen saturation <90%
- **Antidote:** 10% Calcium gluconate 10ml IV over 10 minutes

**CONTROL HYPERTENSION**
- **Treat hypertension if systolic BP ≥ 160 mmHg or diastolic BP ≥** 110 mmHg or MAP ≥ 125 mmHg
  Aim to reduce BP to around 130-140/90-100 mmHg
- **Beware maternal hypotension and fetal heart rate abnormalities** – monitor FH with continuous CTG
- **LABETALOL** Up to 50mg IV stat slowly then erect IV infusion: 200 mg in 200 ml N Saline at 40 mg/hr, doubling dose at 1/2 hourly intervals as required to a maximum of 160 mg/hour
- **NIFEDIPINE 10mg oral stat dose; repeat every 20 mins to a maximum of 40mg**
- **HYDRAZALINE** 10mg IV slowly.
  Repeated doses of HYDRALAZINE 5mg IV 20 minutes apart may be given if necessary
  **Close liaison with anaesthetists: may require plasma expansion**

**If not postpartum DELIVER**
- There is no place for the continuation of pregnancy if eclampsia occurs
- **"STABILISE" THE MOTHER BEFORE DELIVERY**
- **DELIVERY IS A TEAM EFFORT** involving obstetricians, midwives, anaesthetists and paediatricians
- Ergometrine should not be used in severe eclampsia – syntocinon 5 units im / slowly iv may be used
- Consider prophylaxis against Thromboembolism
- Maintain vigilance as the majority of eclamptic seizures occur after delivery

## TAKEN FROM:

GUIDELINES FOR THE MANAGEMENT OF SEVERE PRE-ECLAMPSIA AND ECLAMPSIA. GUIDELINES & AUDIT IMPLEMENTATION NETWORK (GAIN), 2010.

**REF:**
https://www.rqia.org.uk/RQIA/files/84/8425a24b-5ceb-448d-b214-3be15e19bd32.pdf

# ECTOPIC PREGNANCY

**Signs and Symptoms:**
Abdo pain - especially if signs of peritonism or localising to either lower quadrant
PV bleeding (not always)
Shoulder tip pain
Haemodynamic instablity (1st sign may be postural drop)
Dizziness/syncope
Unexplained anaemia
Any pregnant patient with abdominal pain who has not had a uterine pregnancy confirmed

**Increased risk if:**
Prev ectopic, IUD, prev STD, prev fallopian tube surgery, prev sterilisation, smoker,
Remember possibility of dual pregnancy in IVF (intrauterine preg on US but additional ectopic)

**Investigations:**
HCG (Urine or serum)
FBC
G+S
USS
FAST scan if unstable

I**mmediate Management:**
A to E Assessment
IV access x 2
Analgesia
IVF
Consider need for blood transfusion or major haemorrhage
Urgent Gynae review: If unstable need surgery

**REF:**

# EPISTAXIS

## Pressure:
Pinch nose and apply pressure over soft tissue

VBG/obs if suspecting significant blood loss

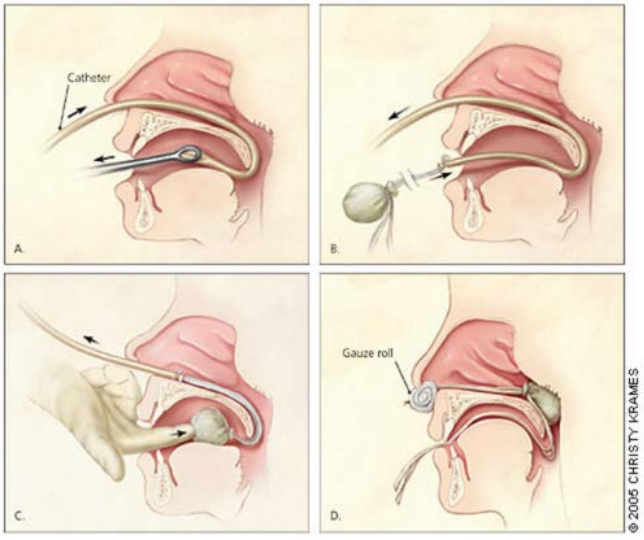
## Cautery:
Suction or ask patient to blow nose
Identify site of bleeding and cauterise with silver nitrate and 'donut'.
NEVER cauterise both sides of the septum as it affects blood supply

## Apply topical medication:
Saturate gauze with TXA (can consider adrenaline/TXA)

## Packing:

### Anterior nasal packing
Rapid rhino - immerse in saline and place horizontally, inflate slowly with air (usually 5-10ml) until good seal but not too uncomfortable.
If ongoing bleeding consider posterior bleed.

### Posterior packing
Slows bleeding from a posterior source.
Foley catheters can be used as a temporary solution in the ED.
Size 12 or 14 gauge catheters should be advanced one at a time through the nostril, along the floor of the nose into the nasopharynx until seen in the pharynx.
Each balloon should be inflated with 5-10 mls water and gentle traction applied.




**ONCE NASAL PACCKING IN SITU:**
**@ the RFH, ref to ENT at UCLH 07415 624966**

**REF:**
http://www.emdocs.net/emergency-department-management-posterior-epistaxis/

# ECMO: EXTRACORPOREAL MEMBRANE OXYGENATION

## USES:

It is a technique that oxygenates blood outside the body and can be used for potentially reversible severe cardio - respiratory failure when conventional ventilation is unable to oxygenate the blood adequately.
ECMO is a highly specialised technique, which needs the input of intensive care specialists, cardiothoracic surgeons as well as ECMO-trained nurses and perfusion scientists.

## AIMS:

in respiratory failure to allow the injured lung to recover whilst avoiding certain recognised complications associated with conventional ventilation, high risk and only used as a matter of last resort in difficult cases.
The procedure involves removing blood from the patient, taking steps to avoid clots forming in the blood, adding oxygen to the blood and pumping it artificially to support the lungs.

## INDICATIONS:

### Acute severe respiratory failure: veno-venous ECMO

- Patient <65 years old with reversible cause of respiratory failure and no severe comorbidities
- Ventilatory support must have been trialled and maximised
- Ventilator time <7 days
- If all of the above and patient has failed to respond, consider ECMO

### Circulatory failure - cardiac origin: veno-arterial ECMO

- Patient <65 years old with a reversible cause of cardiac failure and no severe comorbidities
- Diagnosis must be primary cardiac failure either cardiogenic shock or pulmonary embolus
- Check all conventional support modalities are maximised
- If shock persists despite maximal therapy and above criteria fulfilled, implement the ECMO referral process

## REFERRAL PROCESS @ THE RFH:

### PAEDIATRICS:

Discuss with CATS
Nearest centres = Royal Brompton Hospital (02073528121) and GOSH (02074059200)

### ADULTS:

Discuss with ITU at RFH
Nearest centres = Brompton (02073528121) and Papworth (01223638000)

**REF:**

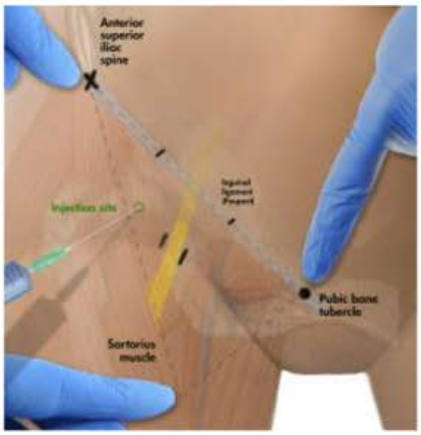
# Fascia Iliaca Nerve Block

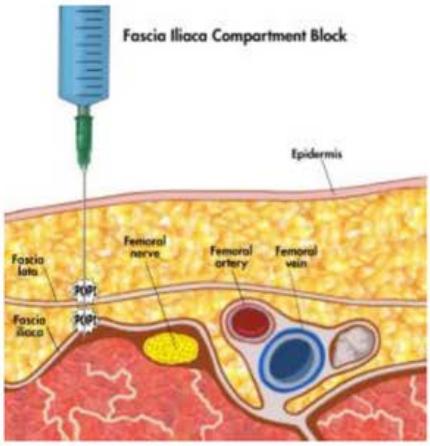
May 2016

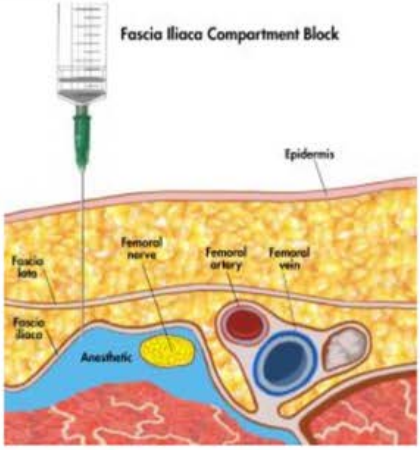
## Regional anesthesia

For Hip fractures, proximal and mid-shaft Femur fractures.

Reliably blocks the femoral nerve. Analgesia lasts 6+ hours. Reduces pain. Reduces delirium.




## Hip Fractures in ED

| | |
|---|---|
| **Pain control** | Early, frequent reassessment.<br>If > two doses opioids, consider FICB |
| **Pick** | Oral acetaminophen (IV acetaminophen)<br>Fentanyl 25mcg IV<br>Hydromorphone 0.2-0.4mg IV<br>Avoid NSAIDS |
| **FICB** | Easy.<br>Land mark or Ultrasound directed.<br>Monitor x 30 min.<br>VS q15 min x2. |
| **Also** | Hospital bed<br>Foley catheter<br>ECG<br>Keep NPO<br>Procedure note |

## Fascia Iliaca Compartment Block

- Consent
- Free flowing IV
- On monitor
- Ropivacaine 60mls
- FICB kit – Ortho cart.

## Landmark technique for FICB

Draw a line between **ASIS and pubic tubercle**, divide into thirds. Medial third is vessels, lateral third is goal.

Needle insertion is 1cm caudad to junction between lateral and middle third

With blunt needle feel two pops. Aspirate prior to injection and after every 5mls.

Inject volume of 0.2% ropivacaine using 1ml/kg (=2.0mg/kg)

There should be no resistance to injection, if there is you are likely too deep in the iliacus muscle, pull back gently.

Injection should not be painful.

Onset of analgesia within 5-15 minutes.

Test analgesia by gentle rotation of leg, anterior thigh sensation

**DRUG DOSES:**

Lignocaine for local bleb

Bupivicaine 0.25% 2-2.5mg/kg
OR
Ropivicaine up to 2mg/kg
Dilute to 25-50mls

**REF:**

https://img.grepmed.com/uploads/4598/anasthesiology-geriatrics-procedure-nerveblock-emergencymedicine-original.jpeg

## UGIB

### A-E Approach:

Protect airway, oxygenate, ensure 2 x large bore access and G+S sent, consider enacting major haemorrhage protocol
Consider reversal of anticoagulants
Assess for additional diagnosis (such as sepsis or liver failure)

### For Resucitation:

Start IV fluid 500ml
Aim Haemoglobin 7-8 - might only require fluid resuscitation
O negative blood in fridge in ED, consider other blood products e.g. pack 1
Do NOT give TXa as standard (unless advised for reversal of anticoagulants or as part of the major transfusion bundle)
Consider a PPI - omeprazole IV 40-80mg or pantoprazole 40mg IV

### If suspected variceal bleed:

Ceftriaxone 2g IV
Terlipressin 2g IV - do an ECG first as it vasoconstricts and may cause ischaemia, give reduced 0.5mg dose if history IHD

### For definitive management (OGD):

Discuss with medics +/- on call endoscopy/gastro team

### @ RFH:

If known or suspected variceal bleed - ref hepatology (medics OOH)
If non variceal - ref to gastroenterology (medics OOH)
If requires OGD in hours refer to specialist team as above but OOH all emergency endoscopy is done by hepatology.

Involve ICU if haemodynamically unstable or ongoing transfusion requirement

## Lower GI Bleed

Following (or during) initial resuscitations contact surgeons: definitive treatment = colonoscopy or surgery (or if active bleeding point angiography and embolisation)

Consider CT angiogram only if actively bleeding (if not actively bleeding there will be no visible bleeding point) and contact interventional radiology as soon as CT available as will review CT themselves to see if amenable for embolisation.

**REF:**

Emergency Department RFH

# Emergency Management of Hypercalcaemia in Adults

NHS Royal Free London NHS Foundation Trust

**Causes:** Primary hyperparathyroidism or malignancy **(90% of cases)**
***Less common causes include:*** *Drugs (*Thiazide diuretics, Lithium, Hypervitaminosis D, Hypervitaminosis A), Familial hypocalciuric hypercalcaemia, Non-malignant granulomatous disease, Thyrotoxicosis, Tertiary hyperparathyroidism, Adrenal insufficiency, Phaeochromocytoma, Rhabdomyolysis, Theophylline toxicity, Immobilisation.
**Clinical features:** Polyuria, thirst, anorexia, nausea, constipation, muscle weakness, mood disturbance, cognitive dysfunction, confusion, coma, renal impairment, Nephrolithiasis, nephrocalcinosis, pancreatitis, peptic ulceration, Hypertension, cardiomyopathy, band keratopathy.
**Acute ECG changes:** Short QT interval and other conduction abnormalities

## Hypercalcaemia ($CCa^{++} \geq 2.60$ mmol/L)

Treatment depends on severity of hypercalcaemia in terms of presence of symptoms, duration and corrected calcium ($CCa^{++}$) level. **Investigations include:**
**History:** Symptoms of hypercalcaemia and duration, symptoms of underlying causes (e.g. weight loss, night sweats, cough), family and medication history.
**Examination:** ABCDE assessment with focus on cognitive impairment, fluid balance status and underlying causes (e.g. neck, respiratory, abdomen, breasts, lymph nodes)
**Send bloods for:** FBC, CRP, UCEs, LFTs, Bone profile, Mg, PTH, Vit D **Obtain 12-lead ECG**

**Top Tip:**
• **If patient is known to *RFH Renal* service or is *dialysis* patient please contact on call Renal registrar for advice.**

**Mild Hypercalcaemia** **$CCa^{++}$ 2.6 - 3.0 mmol/L**

Often asymptomatic and does not usually require urgent correction

If new diagnosis of malignancy suspected → consider 2 week wait Referral

If diagnosis of primary hyperparathyroidism is suspected based on serum PTH results → arrange referral to endocrinology - urgency depends on clinical judgement.

• Follow up with GP to monitor $Ca^{++}$ levels weekly

**Moderate Hypercalcaemia** **$CCa^{++}$ 3.0 – 3.5 mmol/L**

• If asymptomatic treat as mild hypercalcaemia as above.
• May be well tolerated if it has risen slowly, but may be symptomatic and prompt treatment is usually indicated

**Severe Hypercalcaemia** **Corrected $Ca^{++} \geq 3.5$ mmol/L and Symptomatic**

• **Continuous ECG monitoring (monitor bed) required**
**Give 0.9% saline IV 4–6 L in 24 hours**
• Monitor for fluid overload if renal impairment or elderly.
• Loop diuretics rarely used and only if fluid overload develops; not effective for reducing serum **$Ca^{++}$**
• May need to consider dialysis if severe renal failure

If further treatment required after IV 0.9% saline, **consider** IV bisphosphonates

**Zolendronic acid 4 mg over 15 min**
**OR** Pamidronate 30–90 mg (depending on severity of hypercalcaemia) at 20 mg/h
**OR** Ibandronic acid 2–4 mg

• Give more slowly and consider dose reduction in renal impairment.
• Monitor serum calcium response: will reach nadir at 2–4 days
• Can cause **hypocalcaemia** if vitamin D deficiency or suppressed PTH

**Second line treatments**
**Glucocorticoids (inhibit 1,25OHD production)**
• In lymphoma, other granulomatous diseases or 25OHD poisoning
• Prednisolone 40mg daily • Usually effective in 2 to 4 days

**Calcitonin** → Can be considered if poor response to bisphosphonates

**Seek senior help if patient is fluid restricted**

Emergency Department RFH

# Emergency Management of Hyperkalaemia in Adults

NHS Royal Free London NHS Foundation Trust

**Hyperkalaemia ($K^+$ ≥5.5 mmol/L)**
[if in doubt → Confirm $K^+$ level with repeat VBG]

**Airway Breathing Circulation Exposure (ABCDE) Approach**
Seek expert help if airway, breathing or circulation compromised

**First 15-30 mins –** Assess patient and protect heart

| Mild | Moderate | Severe |
|---|---|---|
| $K^+$ 5.5-5.9 mmol/L | $K^+$ 6.0-6.4 mmol/L | $K^+$ ≥6.5 mmol/L |
| Consider the cause and if treatment indicated | Treatment guided by clinical scenario, ECG and rate of rise | Emergency treatment indicated |

**Perform 12 lead ECG**
**Acute ECG changes present:** Peaked T waves  Absent or flattened P waves  Broad QRS  Sine wave  Bradycardia  VT

**YES**

**Give 10 ml 10% Calcium gluconate IV through large vein over 3 mins**
- If **digoxin toxicity** give over 30 mins in 100ml 0.9% sodium chloride
- Repeat ECG and consider further doses after 5 mins if ECG changes persist (max 30 ml)
- If periarrest or cardiac arrest give 10 ml 10% calcium chloride over 3-5 mins

**NO**

**Next 30-60 mins –** Shift $K^+$ into cells

**Give 10 units insulin (Actrapid) in 50ml 50% glucose IV over 15-30 mins (alternative is 125 ml of 20% glucose)**
Give in severe hyperkalaemia (assess ECG and rate rise)

**CONSIDER:** Salbutamol 10-20 mg nebulised in moderate or severe hyperkalaemia
- Use with caution if arrhythmia

Check for acidaemia using blood gas and if acidaemic **consider** sodium bicarbonate
Only administer following recommendation from **ITU** or **renal team**
Administer 500 ml 1.26% sodium bicarbonate by IV infusion

**After 1 hour –** Remove $K^+$ from body

Monitor serum $K^+$ at 1, 2, 4 and 6 hours after initial treatment
Monitor blood glucose every 30 mins for first 2 hours and then hourly for next 4 hours

**$K^+$ ≥6.5**

Seek advice from **ITU** or **renal team**
Consider for **renal replacement therapy**

Consider causes of hyperkalaemia, prevent further rise and recurrence.
Review and consider stopping nephrotoxic medications (ACEi, ARB, $K^+$ sparing diuretics, NSAIDS); and assess diet.
**Consider** calcium resonium 15 gx4/day oral or 30 gx2/day PR.

Emergency Management of Hyperkalaemia in Adults _ Version 1  Author: Dr Rajesh Kumar ED Consultant RFH  May 2020 [review May 2023]

# HHS: HYPEROSMOLAR HYPERGYCAEMIC STATE

## Diagnosis

Type 2 diabetics (or new dx DM II)
Glucose >30mmol/L
Hyperosmolality, serum osmolality >320mOsm/kg (Osmolality = 2Na+glucose+urea)
Dehydration and hypovolaemia

Often also:
Minimal ketonuria (blood ketones <3, urinary <2)
Normal PH but can be acidotic
Decreased GCS/confusion

## Management

A-E Assessment
IV accessIVF: 0.9% saline 1 litre over 1hr (more slowly if CCF, more rapid if SBP< 90)
Correct K+ (only if K+ <5.5)
Insulin at 0.05 units/kg/hr ONLY if ketones>2 (urine), >1 (blood)
Aim for BM 10-15mmmol/L - If BM <15, start 10% dextrose at 125mls/hr as well as 0.9% saline
Antibiotics and antiemetics as needed
Stop metformin/diuretics
LMWH - tinzaparin prophylaxis 4,500units sc if >50 kg weight
Septic screen
NG tube
Hourly fluid balance monitoring either via catheter or urine output measuring

## Investigations

Glucose and Serum osmolality
Venous blood gas
Blood/urinary ketones
Routine bloods and cultures
Septic screen
ECG
BHCG if female and <55
Mental state examination
**Rpt Glucose, U+E and Osmolality hrly initially**

## TREATMENT AIMS:

Normalise osmolality (Reduce by 3-8mOsm/Kg/hr)
Replace fluid and electrolyte losses (+ve fluid balance 2-3L by 6hrs)
Normalise blood glucose (Reduce glucose no more than 5mmol/hr)
Prevent thrombosis

**REF:**
The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes, Joint British Diabetes Societies Inpatient Care GroupAugust 2012, https://diabetes-resources-production.s3-eu-west-1.amazonaws.com/diabetes-storage/migration/pdf/JBDS-IP-HHS-Adults.pdf

Emergency Department
RFH

# Emergency Management of Hypocalcaemia in Adults

NHS
Royal Free London
NHS Foundation Trust

**Causes of hypocalcaemia:** Hypoparathyroidism (primary or secondary), Chronic renal insufficiency, Surgical hypoparathyroidism (typically after thyroid or parathyroid surgery), Acute pancreatitis, Pseudohypoparathyroidism, Rhabdomyolysis, Tumour lysis syndrome, Vitamin D deficiency (osteomalacia), Severe hypomagnesaemia.
**Clinical features:** Muscle cramps, numbness and paraesthesia in perioral area or in extremities, general malaise, confusion or altered affect, carpo-pedal spasms, seizures, tetanic contraction (including laryngospasm). **Acute ECG changes:** Prolonged QT interval, T wave inversion, AV Block, cardiac arrest.
**Positive Chvostek's sign:** elicited by tapping over facial nerve and observing for contraction of ipsilateral facial muscles.
**Positive Trousseau's sign:** elicited by inflating a BP cuff to above systolic BP for 3-5 mins and observing for Carpo-pedal spasm (which cannot be overcome).

**Hypocalcaemia ($CCa^{++} \leq 2.20$ mmol/L)**
Treatment depends on severity of hypocalcaemia in terms of presence of symptoms, duration and corrected calcium ($CCa^{++}$) level.

**Top Tip:**
- **If patient is known to *RFH Renal* service or is *dialysis* patient please contact on call Renal registrar for advice.**

**Mild Hypocalcaemia:** Asymptomatic with **$CCa^{++} \geq 1.9$ mmol/L**

Oral Calcium replacement is recommended:

- Sandocal 1000, 2 tablets BD

Alternatives include:
- Adcal 3 tablets BD **OR**
- Cacit 4 tablets BD **OR**
- Calcichew Forte 2 tablets BD

[preferably between meals to increase availability of calcium for intestinal absorption]

- If hypocalcaemia associated with insufficient vitamin D: **Give calcium carbonate with colecalciferol (Calceos®) 1 tablet 2-3 times /day.**
- Monitor $Ca^{++}$ levels weekly and titrate treatment accordingly.
- Follow up with GP.

**Severe Hypocalcaemia** **Corrected $Ca^{++} \leq 1.9$ mmol/L and Symptomatic**

**Send bloods for:** FBC, UCEs, Bone profile, Mg, PTH, Vit D **Obtain 12-lead ECG**

- **Continuous ECG monitoring (monitor bed) required**

**Give 10-20ml 10% calcium gluconate in 50-100ml of 5% Glucose IV over 10 mins** (This can be repeated until patient is asymptomatic) followed up with calcium gluconate IV infusion as: **Dilute 100 mL of 10% calcium gluconate (10 vials) in 1 L of Normal saline or 5% dextrose and infuse at 50–100 mL/h.**

Check plasma potassium and magnesium levels

**Correct plasma magnesium if < 0.60mmol/L**
Give 24 mmol 20% $MgSO_4$ (30 mL of 20% $MgSO_4$) in 500 mL Normal saline or 5% dextrose IV infusion over 24 hours

**Correct plasma $K^+$ if < 2.5mmol/L**
Give 40mmol potassium in 1L of NaCl 0.9% or glucose 5% IVI over 4-6 hours

Check repeat Corrected $Ca^{++}$ 4-6 hours after administration of calcium gluconate infusion.
Check repeat $K^+$ and Mg 4-6 hours after administration.

Titrate the rate of infusion to achieve normocalcaemia and continue until treatment of the underlying cause has taken effect.

**Seek senior help if patient is fluid restricted**

Emergency Department RFH

# Emergency Management of Hypokalaemia in Adults

NHS Royal Free London NHS Foundation Trust

**Causes of hypokalaemia:** GI Loss, drugs (diuretics, laxatives, steroids, salbutamol, insulin), Renal losses (diabetes insipidus, renal tubular disorders, dialysis), Endocrine disorders (cushing, hyperaldosteronism), Magnesium depletion, Metabolic alkalosis, poor dietary intake.
**Symptoms:** Fatigue, weakness, leg cramps, constipation. **In severe cases:** Rhabdomyolysis, ascending paralysis and respiratory difficulties.
**Acute ECG changes:** U waves Flattened T waves ST segment changes VF/pVT

## Hypokalaemia ($K^+ \leq 3.5$ mmol/L)

Treatment depends on severity of hypokalaemia and presence of symptoms and ECG abnormalities.

### Mild Hypokalaemia — $K^+$ 3.0-3.4 mmol/L

Usually asymptomatic patients.

Oral $K^+$ replacement is recommended:
- **Sando K® (1 tablet contains 12mmol $K^+$ ions) 2 tablets TDS (72mmol/day) for 72 hours,** or if not tolerated
- **Kay-Cee-L® solution (1ml contains 1mmol of $K^+$ ions) 25mmol TDS (75mmol/day)**

- Monitor $K^+$ levels daily and adjust treatment accordingly.
- Follow up with GP.
- Consider IV replacement if unable to tolerate PO.

### Moderate Hypokalaemia — $K^+$ 2.5-2.9 mmol/L

Mild symptoms or asymptomatic patients.

Oral $K^+$ replacement is recommended:
- **Sando K® 2 tablets QDS (96mmol/day) for 72 hours,** or if not tolerated
- **Kay-Cee-L® solution 25mmol QDS (100mmol/day)**

- Monitor $K^+$ levels daily and adjust treatment accordingly.
- Follow up with GP.
- Consider IV replacement if unable to tolerate PO.

### Rate and concentration of potassium chloride infusions:

- Maximum concentration of potassium chloride for peripheral infusion is 40 mmol/L.
- Maximum infusion rate is 20 mmol/hour.
- Infusion rates ≥40 mmol/hour pose a serious risk of cardiac arrest.

### Symptomatic or Severe Hypokalaemia — $K^+ \leq 2.5$ mmol/L

Emergency treatment indicated — **Obtain 12 lead ECG**

**Give 40mmol potassium in 1L of sodium chloride (NaCl) 0.9% or glucose 5% IV over 4-6 hours in a large peripheral or central vein.**
- Continuous ECG monitoring required
- Consider Central venous access early
- If periarrest or cardiac arrest give 2mmol/min for 10 mins, followed by 10mmol over 5-10 mins then monitor $K^+$ levels and titrate IV infusion.

Check plasma magnesium, calcium and phosphate levels

**Correct plasma magnesium if < 0.60mmol/L**
Give 100 ml of magnesium sulfate 20mmol/ 100mL IV infusion over 4 hours

**Correct plasma calcium if < 2.0mmol/L**
Give 10ml 10% calcium gluconate IV over 3-5 mins in a large peripheral vein.

Check repeat $K^+$ 4-6 hours after administration of IV KCL

If $K^+$ is now > 3.0 mmol/L
- Treat as mild hypokalaemia
- Stop ECG monitoring.

If $K^+$ is still ≤ 2.5 mmol/L

Give 40mmol potassium in 1L of NaCl 0.9% or glucose 5% IV over 4-6 hours

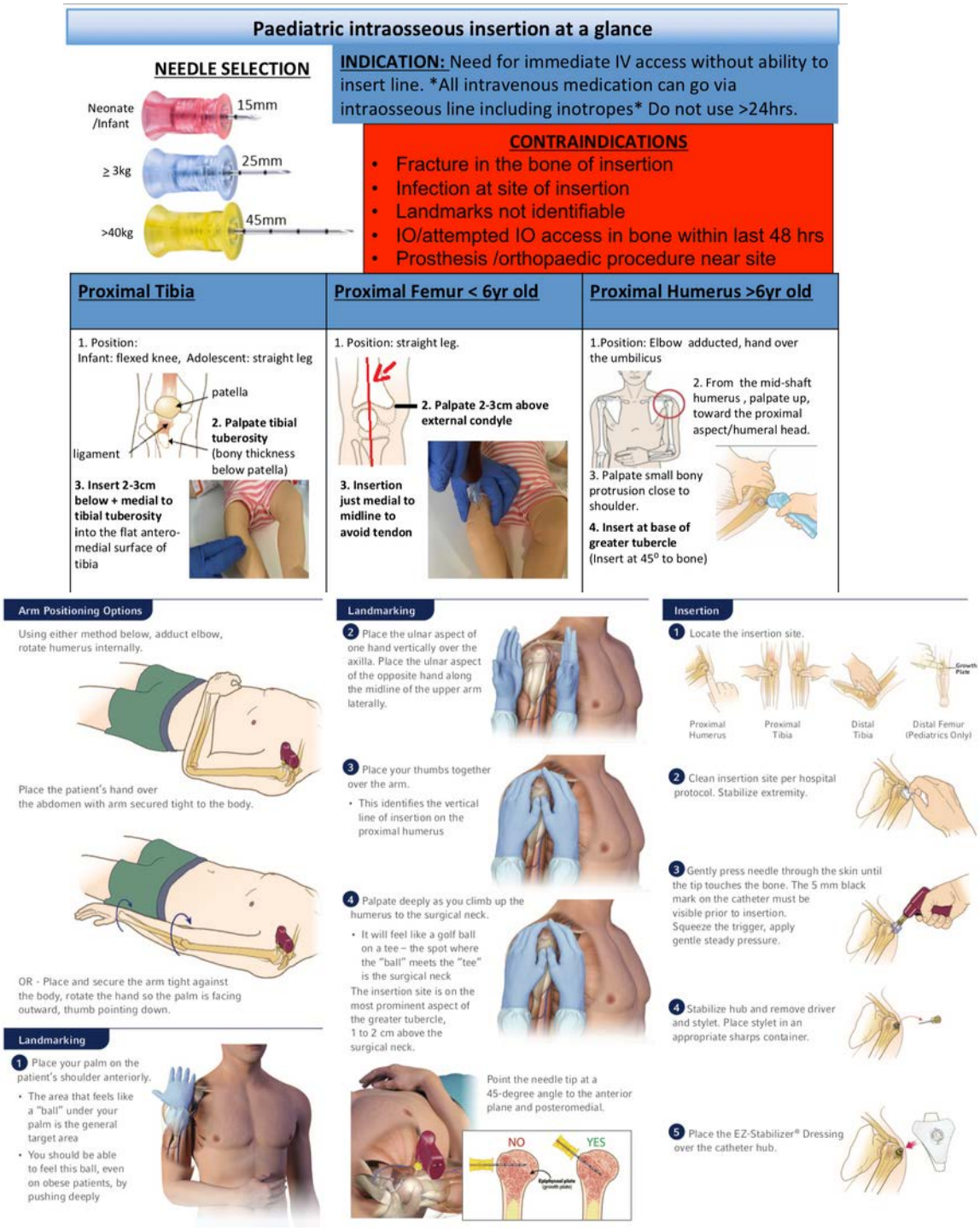
Monitor $K^+$, $CCa^{++}$ and $Mg^{++}$ after 4-6 hours of infusion

If $K^+$ is now > 3.0 mmol/L

If $K^+$ is still ≤ 2.5 mmol/L

Seek senior help if patient is **fluid restricted**

# INTRAOSSEOUS INSERTION




## IO TIPS:

Don't put the samples in the pod without labelling IO and calling the lab first
Don't run samples through the gas machine
Anything can go through the IO including blood but needs to be under pressure (connect to pressure bag or squeeze)

Needle sizes are opposite to cannulas (yellow is BIG)

In adults infiltrating 1ml lignocaine prior to flushing can help ease pain of use - use extreme caution with dosing this in children, follow CATS guidance

Best site for paeds is distal femur (unless child is older)
Best site in adults is humeral head (closer to heart)

**REF:**
Taken from The Southampton Oxford Retrieval Team (SORT) IO guidance, https://www.sort.nhs.uk/Media/Guidelines/Intraosseous-IO-insertion-guide.pdf
https://www.teleflex.com/usa/en/product-areas/emergency-medicine/intraosseous-access/arrow-ez-io-system/literature/Emergency-Medicine-Pocket-Guide_MC-000609Rev2.pdf

# ISOPRENALINE INFUSION

**Action:**
Stimulates B1 and B2 adrenorceptors to increase cardiac output by myocardial contractility and heart rate

If there is systemic hypotension/cerebral hypoperfusion/heart failure/life-threatening arrythmia, start medical therapy until temporary pacing is initiated

Central access is preferred but can be given peripherally

Use isoprenaline in caution with patients with ischaemic heart disease, diabetes, hypertension and hyperthyroidism

**1-4mcg/min IV for severe bradycardia**

**IV infusion via peripheral line (emergencies)**
Take 10mls from 500ml bag of 5% glucose (NOT sodium chloride)
Add 10mls of isoprenaline 0.2mg in 1ml (10 x 1ml amps) and agitate
This gives a final concentration of 2mg in 500mls equivalent to 4mcg/ml

Start at an infusion rate of 1mcg/min (15 mls/hr)
Titrate until a satisfactory heart rate is achieved at steps of 1mcg/min every 2-3 minutes up to a max of 10mcg/min

| Dose in microgram/min | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Infusion rate (ml/hr) | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 |

**IV infusion in fluid restriction via central line**
Remove 10mls from a 50ml bag of 5% glucose
Add 10mls isoprenaline 0.2mg in 1ml (10 x 1ml amps) and agitate
This gives a concentration of 2mg in 50mls equivalent to 40mcg/ml
Start at a rate of 1mcg/min (1.5mls/hr)

| Dose in microgram/min | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Infusion rate (ml/hr) | 1.5 | 3 | 4.5 | 6 | 7.5 | 9 | 10.5 | 12 | 13.5 | 15 |

REF:

# CANTHOTOMY/CANTHOLYSIS

**Background**

**The orbit is a relatively closed compartment**
An acute increase in orbital volume = increased orbital pressure and ischaemia of optic nerve and retina
Without decompression, irreversible vision loss within 90-120mins
Most commonly due to retrobulbar haemorrhage from trauma

**Symptoms & Signs of increased intraocular pressure**

- Significant pain
- Reduced vision
- Limited eye movements
- Diplopia
- Proptosis
- Ecchymosis around eye
- Bloody chemosis
- Resistance to retropulsion

**Equipment**

- Lidocaine 1 or 2% with adrenaline
- Sterile gloves
- 5ml Syringe with orange needle
- 20ml syringe + N.Saline for irrigation
- OPHTHALMIC TRAY
- Straight heaemostat
- Sterile scissors
- forceps

**Step 1**

Inject 1ml of local anaesthetic into lateral canthus

Direct needle towards lateral orbital rim and begin injecting when touches bone

Irrigate eye with saline

**Step 2**

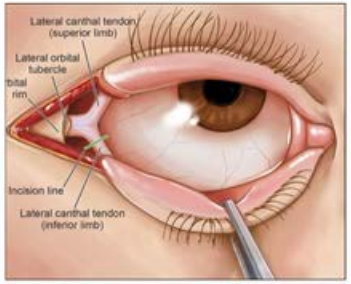
Use haemostat to clamp skin of lateral canthus all the way to orbital rim for 1-2mins

This facilitates haemostasis and marks location where incision to be made

GRI ED 2017

**Step 3**

Use scissors to make 1-2cm incision at lateral corner of eye extending laterally outwards




Lateral canthotomy decreases pressure but often insufficient alone

PROCEED TO CANTHOLYSIS

**Step 4**

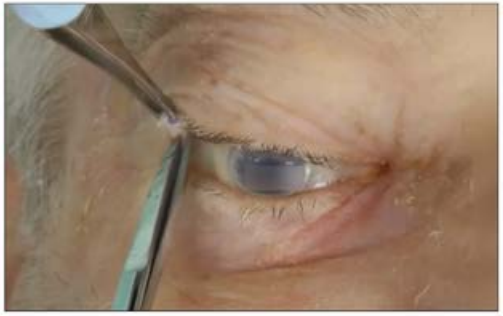
Apply continuous retraction on lower lid

Scissors directed along lateral orbital rim (away from globe) - palpate and dissect to the inferior limb of lateral canthus tendon then cut it

**Step 5**

If above insufficient, cut the superior limb of lateral tendon

Dissect superiorly before cutting tendon



GRI ED 2017

REF:
Taken from St Mungo's: https://stmungos-ed.com/surgical/canthotomy

# AAGBI Safety Guideline

## Management of Severe Local Anaesthetic Toxicity

### 1 Recognition

**Signs of severe toxicity:**

- Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions
- Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur
- Local anaesthetic (LA) toxicity may occur some time after an initial injection

### 2 Immediate management

- Stop injecting the LA
- Call for help
- Maintain the airway and, if necessary, secure it with a tracheal tube
- Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
- Confirm or establish intravenous access
- Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses
- Assess cardiovascular status throughout
- Consider drawing blood for analysis, but do not delay definitive treatment to do this

### 3 Treatment

**IN CIRCULATORY ARREST**

- Start cardiopulmonary resuscitation (CPR) using standard protocols
- Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
- Consider the use of cardiopulmonary bypass if available

**GIVE INTRAVENOUS LIPID EMULSION**
(following the regimen overleaf)

- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 h
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

**WITHOUT CIRCULATORY ARREST**
Use conventional therapies to treat:

- hypotension,
- bradycardia,
- tachyarrhythmia

**CONSIDER INTRAVENOUS LIPID EMULSION**
(following the regimen overleaf)

- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

### 4 Follow-up

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases as follows:
  - in the United Kingdom to the National Patient Safety Agency (via **www.npsa.nhs.uk**)
  - in the Republic of Ireland to the Irish Medicines Board (via **www.imb.ie**)

If Lipid has been given, please also report its use to the international registry at **www.lipidregistry.org**. Details may also be posted at **www.lipidrescue.org**

**Your nearest bag of Lipid Emulsion is kept.**

**RESUS DRUG CUPBOARD + BOTTOM DRAW FIB TROLLEY**



## DRUG DOSES:

| STRENGTH | MAXIMUM DOSES | DURATION |
|---|---|---|
| Lignocaine 1% (10mg/ml) | 3mg/kg | 1hr |
| Lignocaine 2% (20mg/ml) | 3mg/kg | 1hr |
| Lignocaine 1% with adrenaline | 7mg/kg | 1.5hr |
| Bupivocaine 0.25% (2.5 mg/ml) | 2mg/ml | 4hr |
| Bupivocaine 0.5% (5mg/ml) | 2mg/ml | 4hr |
| Prilocaine 1% (10mg/ml) | 6mg/ml | 1hr |

Early signs toxicity: Lip tingling, paresthesia or tachycardia

**IMMEDIATELY**

Give an initial intravenous bolus injection of 20% lipid emulsion **1.5 ml.kg$^{-1}$** over 1 min

AND

Start an intravenous infusion of 20% lipid emulsion at **15 ml.kg$^{-1}$.h$^{-1}$**

**AFTER 5 MIN**

Give **a maximum of two** repeat boluses (same dose) if:

- cardiovascular stability has not been restored **or**
- an adequate circulation deteriorates

Leave **5 min** between boluses

A maximum of **three** boluses can be given (including the initial bolus)

AND

Continue infusion at same rate, but:

**Double** the rate to **30 ml.kg$^{-1}$.h$^{-1}$** at any time after 5 min, if:

- cardiovascular stability has not been restored or
- an adequate circulation deteriorates

Continue infusion until stable and adequate circulation restored or maximum dose of lipid emulsion given

***Do not exceed a maximum cumulative dose of 12 ml.kg$^{-1}$***

**REF:**
Guideline_management_severe_local_anaesthetic_toxicity_v2_2010
https://em3.org.uk/foamed/9/7/2018/lightning-learning-local-anaesthetic-toxicity

# MAJOR HAEMORRHAGE

Call **2222** and declare **'Massive Haemorrhage'**

Assign someone to communicate with the lab (x74018 or x33406)

Order either:
Pack 1 (used for non-trauma)
Or
Pack 2 (used for Trauma)
If you require an additional pack, always order pack 2

Identify dedicated Transfusion Lead to ensure blood products ordered, received, hanging and running.

Transfusion lead should liaise with team leader as to what is needed and ensuring adjuncts given as required and investigations continued.

<table>
<tr><th colspan="4">BLOOD PRODUCTS</th><th>ADJUNCTS</th><th>MONITORING</th></tr>
<tr><td>IMMEDIATE ACTION<br>EMERGENCY BLOOD (If required)</td><td>Time Started</td><td>Time Started</td><td>Time Started</td><td></td><td></td></tr>
<tr><td>1st unit O neg</td><td></td><td></td><td></td><td rowspan="2">Confirm runner sent to collect pack 2<br>Tranexamic acid 1g (if indicated)</td><td rowspan="2">Confirm blds sent: FBC, U+E, LFT, Bone Profile, Coag, Fibrinogen, G+S</td></tr>
<tr><td>2nd unit O neg</td><td></td><td></td><td></td></tr>
<tr><td>PACK 2</td><td>1st PACK 1</td><td>1st PACK 2</td><td>2nd PACK (always PACK 2)</td><td></td><td></td></tr>
<tr><td>1st unit RBC</td><td></td><td></td><td></td><td rowspan="14">Give platelets if:<br>• Plt <75<br>• Or consider (in d/w haem reg) if patient on antiplatelet therapy<br><br>Correct clotting:<br>• Give cryo if fibrinogen < 2 g/L<br>• Reverse anticoagulation<br>• Liaise with Heamophilia EARLY<br><br>Give Calcium Chloride 10ml of 10% slowly after every 4th unit RBC given to the patient</td><td rowspan="14">Every 30 mins repeat:<br>FBC<br>Coag + Fibrinogen<br>Bone Profile<br>VBG<br>Temp (KEEP PT WARM)<br>Consider TEG/ROTEM</td></tr>
<tr><td>1st FFP</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Do you need platelets?</td></tr>
<tr><td>2nd unit RBC</td><td></td><td></td><td></td></tr>
<tr><td>2nd FFP</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Do you need Calcium Chloride?</td></tr>
<tr><td>3rd unit RBC</td><td></td><td></td><td></td></tr>
<tr><td>3rd FFP</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Do you need another Pack 2?</td></tr>
<tr><td>4th unit RBC</td><td></td><td></td><td></td></tr>
<tr><td>4th FFP</td><td></td><td></td><td></td></tr>
</table>

**REF:**
RFH Major Haemorrhage Policy for Use in Adults_v1.2
https://freenet2.royalfree.nhs.uk/documents/preview/45718/5251-major-haemorrhage-for-adults-policy-rfl-final-v1-2-upd-doc

# NIV: CPAP VS BiPAP

## CPAP

- Supplies constant fixed positive pressure through inspiration and expiration
- Can be delivered with or without 02
- Recruits lung volume by keeping bronchioles and alveoli open, enabling increased gas exchange

## BiPAP

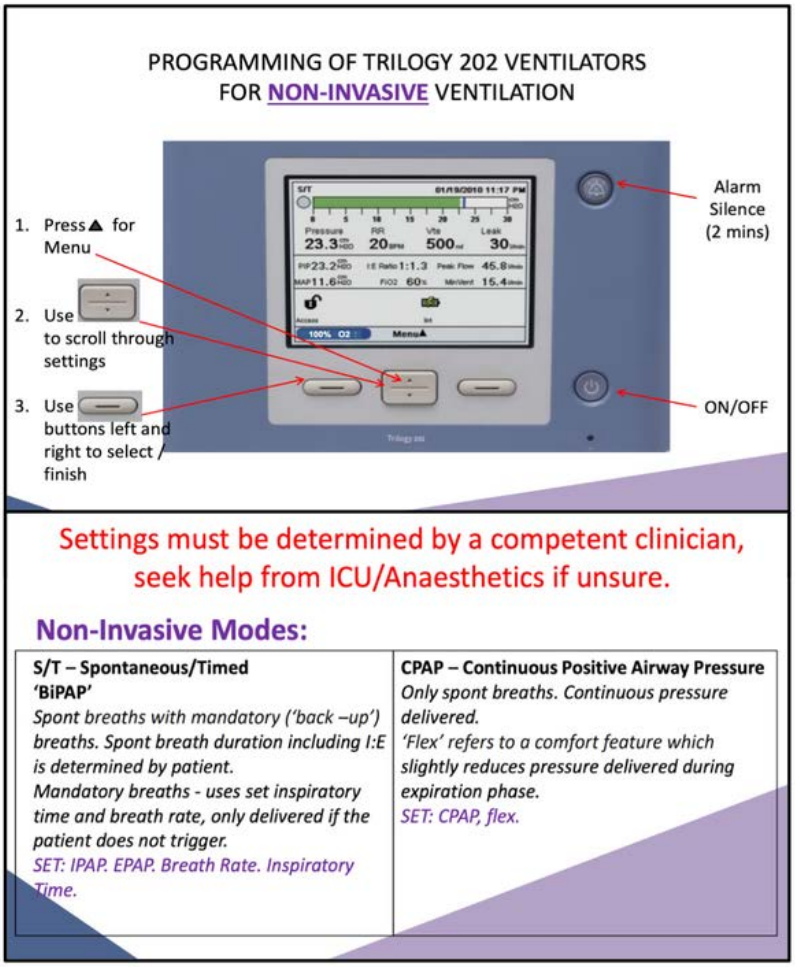
- Supplies a constant positive pressure during expiration (EPAP) plus a higher positive pressure during inspiration (IPAP)
- Recruits lung volume and helps with ventilation, assisting patient to breath in and reducing their work of breathing

### CPAP

| Setting: | Initial value | Comments |
|---|---|---|
| **Dual Prescription** | OFF | Dual Prescription allows separate day and night prescriptions for the patient, not used acutely. |
| **Mode** | CPAP | Continuous positive airway pressure. |
| **Circuit Type** | Passive | Single limb circuit with expiratory port |
| **Flex** | OFF | Can set to 1 or 2 to reduce pressure in expiration phase. |
| **CPAP** | start at 5 | Increase as required - Senior review required. |
| **FiO2** | 100 % | Start high and wean down – As required. Aim for target sats or $paO_2$ as per senior clinician. |
| **Ramp** | OFF | |
| **Nebulizer enabled** | OFF | Can use aeronebs attachment using additional equipment. |

### BiPAP (NIV)

| Setting: | Initial value | Comments |
|---|---|---|
| **Dual Prescription** | OFF | Dual Prescription allows separate day and night prescriptions for the patient, not used acutely. |
| **Mode** | S/T | Spontaneous and timed.<br>Display shows 'Passive S/T' |
| **AVAPS** | OFF | Average volume assured pressure support – not used for BiPAP. |
| **IPAP** | Start at 15 | Aim 20. Increase if $pCO_2$ not falling. Increase by 2 up to max 30. |
| **EPAP** | start at 4 | Can increase - Senior review required. |
| **Breath Rate** | 10 | Only for backup breaths, if patient is not triggering. |
| **Inspiratory time** | e.g 1.5 | Only for backup breaths, if patient is not triggering. |
| **FiO2** | 21 – 100 % | Aim target sats (usually 88-92%)<br>Start at requirement prior to BiPAP starting (e.g. 35%) |
| **Trigger Type** | Auto-trak | Can be adjusted for complex patients, needs senior review. |
| **Rise Time** | 2 | Time taken at start of inspiration to reach full IPAP pressure. Measured in 0.1 sec (i.e. 2 = 0.2 sec) |
| **Ramp** | OFF | |
| **Nebulizer enabled** | OFF | Can use aeronebs attachment using additional equipment. |




REF:

# NIV: BIPAP SET UP

## Indications
Acute exac COPD
pH<7.35
pCO2 > 6.0
Maximal medical therapy completed
Senior review

## Exclusion criteria
Pneumothorax (get CXR ASAP)
Peri-arrest
Airway obstructed
Asthma (except in consultation with ITU)
Metabolic acidosis
Recent GI or facial surgery
Facial/airway burns or trauma
Vomiting or aspiration

## Relative exclusions
Secretions
GCS <8
BP<90 systolic
Bullae

## Ensure Adequate Medical Therapy Prior to starting BiPAP

**02**
**Nebulisers:** salbutamol and atrovent
**Steroids:** hydrocortisone 100mg IV
**Antibiotics:** follow local guidelines (@ the RFH if CAP co-amoxiclav and clarithromycin, if HAP amoxicillin + temocillin)

**IV bronchodilators if indicated**
**Aminophylline:** 5mg/kg loading dose (if not already taking theophylline) infusion 500-700mcg/kg/hr or 300mcg/kg/hr in elderly
**Salbutamol:** infusion 5mcg/minute (3-20mcg/minute range)

## Monitoring
Pulse oximetry, ECG + BP,
ABG - pre and after 30mins/1 hour/2 hours/4 hours

## Settings
Ensure a good seal around the mask:

**BiPAP (NIV)**

| Setting: | Initial value | Comments |
|---|---|---|
| Dual Prescription | OFF | Dual Prescription allows separate day and night prescriptions for the patient, not used acutely. |
| Mode | S/T | Spontaneous and timed. Display shows 'Passive S/T' |
| AVAPS | OFF | Average volume assured pressure support – not used for BiPAP. |
| IPAP | Start at 15 | Aim 20. Increase if $pCO_2$ not falling. Increase by 2 up to max 30. |
| EPAP | start at 4 | Can increase - Senior review required. |
| Breath Rate | 10 | Only for backup breaths, if patient is not triggering. |
| Inspiratory time | e.g 1.5 | Only for backup breaths, if patient is not triggering. |
| FiO2 | 21 – 100 % | Aim target sats (usually 88-92%) Start at requirement prior to BiPAP starting (e.g. 35%) |
| Trigger Type | Auto-trak | Can be adjusted for complex patients, needs senior review. |
| Rise Time | 2 | Time taken at start of inspiration to reach full IPAP pressure. Measured in 0.1 sec (i.e. 2 = 0.2 sec) |
| Ramp | OFF | |
| Nebulizer enabled | OFF | Can use aeronebs attachment using additional equipment. |

**Initiate BIPAP**
Set the ventilator at: **IPAP 14, EPAP 4**

Increase **IPAP** to maximum tolerated by patient in 2 – 3 cm $H_2O$ increments within the first 30 mins
Suggested max. **IPAP** 25cm$H_2O$

Add $O_2$ **only** if $SpO_2$ < 88%
*– aim to* ***maintain*** $SpO_2$ *between 88 – 92%*

**Check ABG after 30 minutes as a minimum, and 30 minutes after any changes to ventilator settings**

Adjust **IPAP** to control $PaCO_2$ *(increasing* ***IPAP*** *will reduce* $CO_2$*)*
*(aim to reduce* $PaCO_2$ *by 1 kPa / hr)*

Adjust oxygen to maintain $SpO_2$ in the range of 88 – 92%

Avoid changing EPAP – unless senior advice sought

**TERMINOLOGY**
- IPAP - Inspiratory positive airways pressure
- EPAP - Expiratory positive airways pressure
- Back up respiratory rate 14 - avoid adjusting unless senior advice sought (SpR or above)
- Rise Time - Length of time taken to reach IPAP, set to a short rise time in acute patients
- Timed Inspiration ($T_i$) - keep between 1.0 – 1.4 seconds for a back up rate of 14 bpm

## Problems
Can impede venous return and drop BP
Can cause pressure damage over nose and face
Watch out for barotrauma at high pressures

**REF:**

# NIV: CPAP SET UP

## Indications

Type 1 respiratory failure/pneumonia
OSA
Acute pulmonary oedema
Chest wall trauma and hypoxia (rarely)

## Exclusion Criteria

Pneumothorax (get CXR ASAP)
Low GCS
Vomiting/aspiration
Confusion/agitation
Bowel obstruction
Facial/airway burns or trauma
Recent upper GI or facialsurgery
Can't protect airway

## Monitoring

Pulse oximetry, ECG + BP,
ABG - pre and after 30mins/1 hour/2 hours/4 hours

## Settings

Start at 5cm H20
Increase gradually (EPAP)
Do not exceed 25cm H20
Ensure a good seal around the mask

PROGRAMMING OF TRILOGY 202 VENTILATORS FOR NON-INVASIVE VENTILATION MODES

**CPAP**

| Setting: | Initial value | Comments |
|---|---|---|
| Dual Prescription | OFF | Dual Prescription allows separate day and night prescriptions for the patient, not used acutely. |
| Mode | CPAP | Continuous positive airway pressure. |
| Circuit Type | Passive | Single limb circuit with expiratory port |
| Flex | OFF | Can set to 1 or 2 to reduce pressure in expiration phase. |
| CPAP | start at 5 | Increase as required - Senior review required. |
| FiO2 | 100 % | Start high and wean down – As required. Aim for target sats or $paO_2$ as per senior clinician. |
| Ramp | OFF | |
| Nebulizer enabled | OFF | Can use aeronebs attachment using additional equipment. |

REF:

# NORADRENALINE INFUSION

Alpha and Beta agonist (increased SVR/afterload and perfusion pressure, increased vasoconstriction and hence preload, inotropy and chronotropy)

Dose:
0.1-1mcg/kg/minute IV, target MAP 65mm Hg

Preferred use in sepsis/neurogenic shock

Adverse effects:
hypertension, reflex bradycardia, hyperglycaemia, peripheral ischaemia, increased afterload and beta effects may increase myocardial work and 02 consumption

THE COLLEGE OF EMERGENCY MEDICINE

## Noradrenaline

4mg = 4mL of 1:1000

Add **4mL** of 1:1000 Noradrenaline to **46mL** 5% Glucose to make **50mL**

Place in a syringe driver.

The starting dose is **0.025microgram/kg/minute**

Below is the infusion table – the rate in mL/hour is given in the box and depends on the weight of the patient (vertical) and the desired rate of infusion (horizontal).

| Wt (kg) | 0.025mcg/kg/min | 0.05 | 0.075 | 0.1 | 0.125 | 0.15 | 0.175 | 0.2 |
|---|---|---|---|---|---|---|---|---|
| 50 | 0.9 | 1.9 | 2.8 | 3.8 | 4.7 | 5.6 | 6.6 | 7.5 |
| 55 | 1.0 | 2.1 | 3.1 | 4.1 | 5.2 | 6.2 | 7.2 | 8.3 |
| 60 | 1.1 | 2.3 | 3.4 | 4.5 | 5.6 | 6.8 | 7.9 | 9.0 |
| 65 | 1.2 | 2.4 | 3.7 | 4.9 | 6.1 | 7.3 | 8.5 | 9.8 |
| 70 | 1.3 | 2.6 | 3.9 | 5.3 | 6.6 | 7.9 | 9.2 | 10.5 |
| 75 | 1.4 | 2.8 | 4.2 | 5.6 | 7.0 | 8.4 | 9.8 | 11.3 |
| 80 | 1.5 | 3.0 | 4.5 | 6.0 | 7.5 | 9.0 | 10.5 | 12.0 |
| 85 | 1.6 | 3.2 | 4.8 | 6.4 | 8.0 | 9.6 | 11.2 | 12.8 |
| 90 | 1.7 | 3.4 | 5.1 | 6.8 | 8.4 | 10.1 | 11.8 | 13.5 |
| 95 | 1.8 | 3.6 | 5.3 | 7.1 | 8.9 | 10.7 | 12.5 | 14.3 |
| 100 | 1.9 | 3.8 | 5.6 | 7.5 | 9.4 | 11.3 | 13.1 | 15.0 |

**Example - Doctor to prescribe starting rate of 0.025mcg/kg/min for a 70 kg man:**

| Date | Time | Infusion Fluid | Volume | Additives (if any) & special instructions | Rate | Doctor's Signature |
|---|---|---|---|---|---|---|
| xx/xx | xx:xx | 5% Dextrose | 50 mL | Noradrenaline 4mg | 1.3 mL/hr | xxxxxxxxx |

Noradrenaline infusion reference guide May 2009

## Tips on starting inotropes

In an emergency you can add 1ml of 1:10,000 adrenaline (cardiac arrest min jet) into 1litre normal saline 0.9% and run it as required to maintain HR and BP
Patients on inotropes need central access either internal jugular or femoral vein, you can use peripheral access or IO initially but central access is much preferred

Alternative inotropes:
Adrenaline, Dobutamine, Dopamine, Metaraminol, Ephedrine, Phenylephrine, Isoprenaline, Vasopressin

**REF:**
https://www.rcem.ac.uk/docs/Sepsis/CEM4719-Noradrenaline-v2-%20Infusion%20Reference%20Guide.pdf

# PACING: EXTERNAL

**Indications:**

- Extreme bradycardia/bradycardia + adverse features (shock/syncope/MI/CCF)
- Failure of medical treatment: atropine 500mcg up to 3mg, isoprenaline 5mcg/min, adrenaline 2-10 mcg/minute, consider aminophylline, dopamine, glucagon, glycopyrrolate

**Equipment:** Defibrillator, 3 clinicians inc 1 qualified to perform sedation, sedation checklist and equipment, monitoring, drugs

**Steps:**

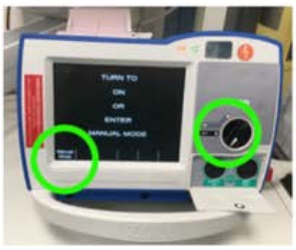
(Can be done by ED but involve anesthetics / ITU if needed)
At least 3 clinicians present - airway/drugs/defib (consider 2222 if required)
Place defib pads onto the patient right pectoral and apical position or anteroposterior (left anterior chest wall and lower left scapula and spine)
Connect to monitor: ECG, BP (with 1-3min cycle), Sats, and Capnography
Give high flow 02
IV access, IVF prepared incase bolus needed
Sedation: options include fentanyl +/- midazolam OR fentanyl +/- propofol, always use drugs you're familiar with and are appropriate for clinical condition

External pacing

i. Flip down plastic cover right lower corner defib machine
ii. Turn dial counterclockwise to select 'Pacing' and press 'Manual Mode'
iii. Press 'Confirm'
iv. Rate automatically set to 70 - reduce to 60
v. Dial up mA to 40 then increase by increments of 10mA until electrical capture (a QRS following each pacing spike)
vi. Check for palpable peripheral pulse, continue to increase mA until pulse felt (mechanical capture)
vii. Increase further 10mA as a safety net

Check BP
Ensure adequate analgesia
Contact cardiology (2027) for definitive management (in hours Barnet, OOH RFH or Barts)

i 

ii 

iii 

v 

**PITFALLS:**

Patient needs to be warm, check VBG and electrolytes, see isoprenaline/resus drugs section for infusion info

**REF:**

## SUGGESTED DRUG DOSES

### Pain:
**Morphine*** 2.5-5mg sc hourly PRN

### Dyspnoea:
**Morphine*** 2.5-5mg sc every 4 hours PRN

### Agitation:
**Midazolam** 2.5-5mg sc hourly PRN

### Secretions:
**Glycopyrronium** 0.2mg sc every 4 hours PRN

### Nausea:
**Haloperidol** 1.5mg sc every 4 hours PRN

*If eGFR<30 use oxycodone 1.25-2.5mg sc hourly PRN
If already using opiates, use ⅙ of patients total amount used in 24 hours

## HOW TO SET UP A SYRINGE DRIVER:

REF:

# PENILE ASPIRATION

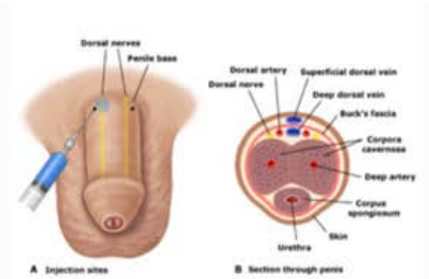
Taken from: https://coreem.net/core/priapism/

- If patient has priapism contact Urology Immediately.
- Low flow (ischaemic) priapsim is an emergency.

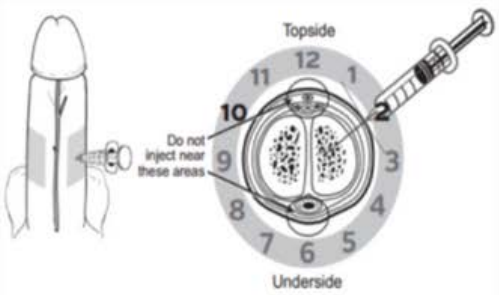
- If urology unavailable and aspiration required:
  - Consider a penile block or local infiltration of local anaesthetic (NOT containing adrenaline).
  - Perform aspiration as below
  - Perform blood gas on aspiration blood to confirm low flow priapism.
  - If aspiration fails leave needle insitu consider irrigation with cold N Saline or intracavernosal injections as per urology advice.

Aspiration and Irrigation

- Usually represents definitive management
- Prepare skin in typical sterile fashion
- Aspiration
  - Insert 19-gauge "butterfly" needle into corpus cavernosa at "10 o'clock" or "2 o'clock" position
  - Puncture site may be anywhere along corpus cavernosa (do not puncture glans)
  - Advance needle at 45 degree angle to skin while drawing back on syringe until blood is returned (should be almost immediate)
  - Continue aspirating until either bright red (arterial) blood returns or detumescence is achieved
  - If successful, can consider instillation of vasoactive substance (Phenylephrine 200-500 mcg or Epinephrine 100 mcg as above)
  - Tips
    - Use small syringe (10 ml) as high level negative pressure can stop aspiration
    - Access one corpus cavernosa only as the two bodies communicate



Dorsal Penile Nerve Block




**REF:**
CoreEM

# PERICARDIOCENTESIS

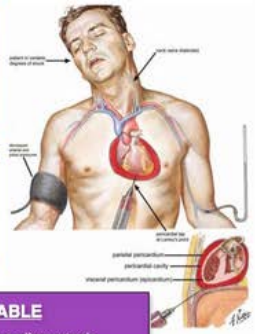
## INDICATION

**PERICARDIAL TAMPONADE & PERIARREST**
Beck's Triad = hypotension, raised JVP and muffled heart sounds
only 33% of cases will have all three

**US DIAGNOSIS**
Visible effusion
Collapsing Right Ventricle
Collapsing Left Ventricle
Distended IVC

**Medical Effusion**
Malignancy
Renal Failure
Connective tissue disease

**Traumatic Effusion**
Only a temporising measure
Effusion likely to reaccumulate until cardiac injury repaired



## CONSIDER

**STABLE**
treat underlying cause (e.g. dialysis for renal failure) and NO pericardiocentesis

**UNSTABLE**
proceed to pericardiocentesis
(fluids and pressors may buy some time)

## EQUIPMENT

**ESSENTIAL**
SINGLE LUMEN CENTRAL LINE PACK
Syringe
18G introducer needle

**NON-ESSENTIAL**
Chlorhexidine
Drapes & sterile gloves
Wire, Dilator and single lumen catheter
3 Way Tap

## BLIND TECHNIQUE

**Greater risk of complication**

## STEPS

Attach needle to syringe

Insert between xiphisternum and left costal margin

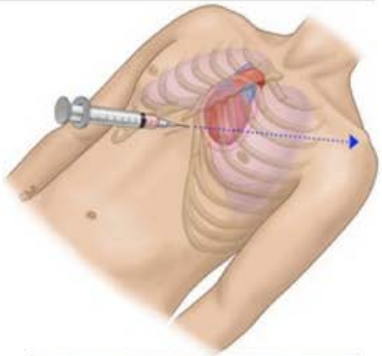
Aim towards left shoulder

Approximately 30-45$^0$ angle to skin

Continually aspirate as needle introduced
stop when fluid aspirated
observe ECG for ST changes (withdraw)

Stabilise needle with non-dominant hand and aspirate fluid observing improvement in haemodynamics
only small amounts of fluid can achieve significant improvement

Continue seldinger-technique to pass single-lumen CVC line into pericardial space
Wire through needle
Dilator
Lumen
Attach 3-way catheter



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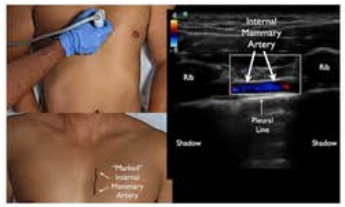
## ULTRASOUND-GUIDED TECHNIQUE




**Choose the site with the largest volume of effusion closest to the probe**

Ensure no lung tissue between skin and heart

Avoid:
Internal Mammary arteries
Subcostal vessels

Equipment and basic procedure the same as per blind procedure

## SUB-XIPHOID

Use a curvilinear probe

Insert needle in-plane and observe needle entering pericardial space

Needle will traverse liver

Can use agitated saline to ensure catheter within pericardial space

## PARA-STERNAL

Use a curvilinear probe

Insert needle in-plane at 30-40$^0$ to skin and observe needle entering pericardial space
Pass over rib to avoid subcostals

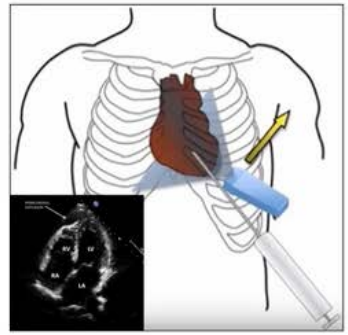
Avoid internal mammary arteries with this approach
Lateral edge of sternum


## APEX

Use a phased array probe

Insert needle in-plane and observe needle entering pericardial space

Ensure no lung tissue between skin and pericardium



GRI ED 2017

REF:
Taken from St Mungo's: https://stmungos-ed.com/surgical/pericardiocentesis

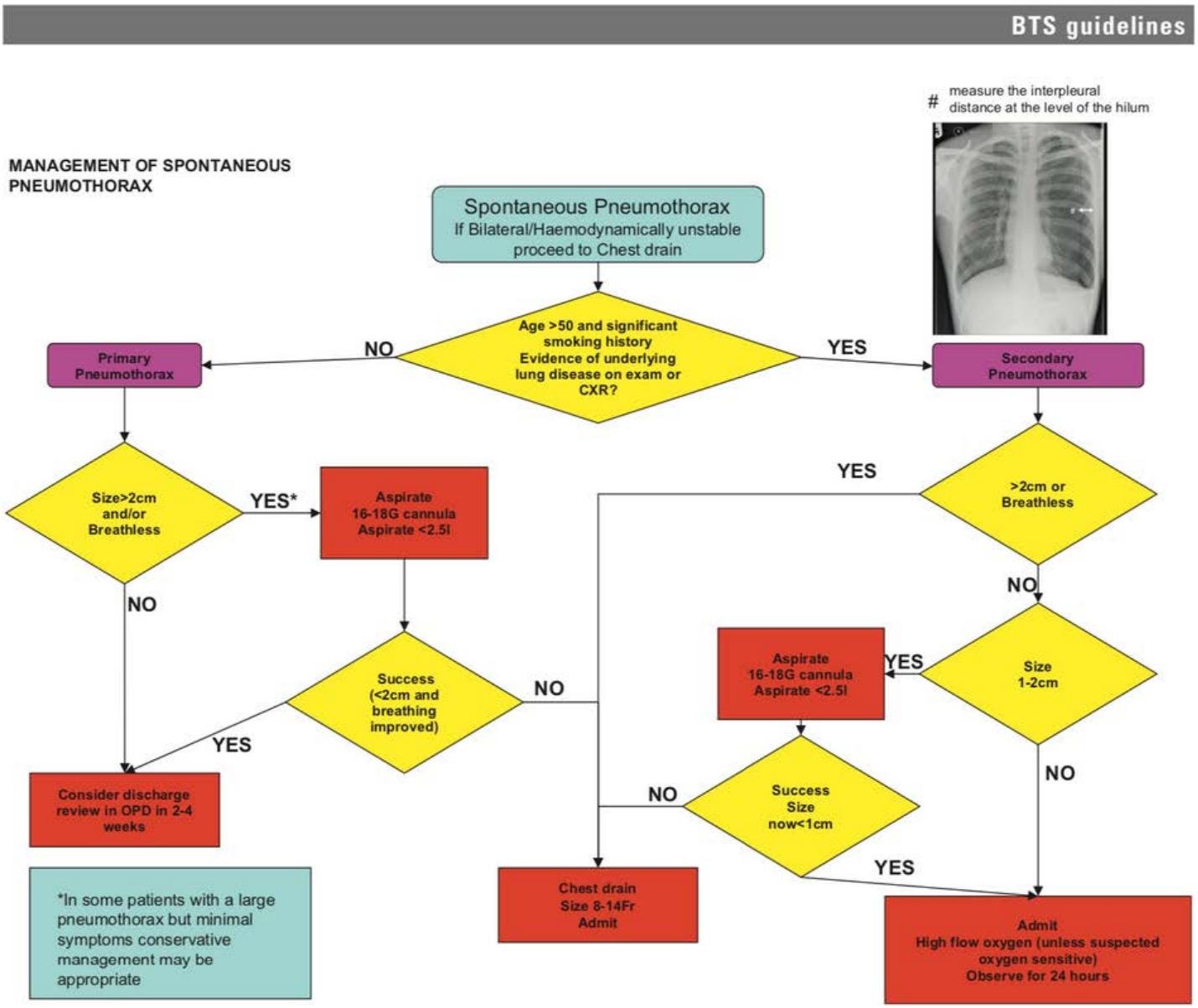



**Figure 2** Flowchart of management of spontaneous pneumothorax.

## UPDATES TO 2010 BTS GUIDELINES

### RCT (NEJM 2020 Jan 30)

Conservative management of primary spontaneous pneumothorax is NOT WORSE than interventional management, with a lower risk of serious adverse events

### RFH advice

Discuss with respiratory team in hours or ED consultant out of hours
Drains are kept in resus - aspiration kit and chest drain both available

**REF:**
Management of spontaneous pneumothorax: British Thoracic Society pleural disease guideline 2010
https://www.bsuh.nhs.uk/library/wp-content/uploads/sites/8/2020/06/BTS-pneumothorax-guideline.pdf

# PRE-ECLAMPSIA

## Signs:

Pregnancy > 20/40 most commonly
Systolic BP >160, MAP >120,
Proteinuria 1+ on reagent strip,
Abnormal bloods: creatinine>90, low platelets <150, raised ALT >70

## Symptoms of severe pre-eclampsia/impending eclampsia:

Facial and peripheral oedema, visual disturbances, headache, chest pain, vomiting
Can rapidly progress to eclampsia involving seizures

## Management of severe hypertension:

Check BP every five minutes until MAP is <120mmHg or BP ≤ 140/90
Oral anti-hypertensives:
1st line labetalol (2nd line nifedipine, 3rd line methyldopa)
If no improvement after 30 minutes oral treatment start IV or repeat PO dose in conjunction with obstetrics
Catheter
Fluid balance
Urgent O+G Consult

## Consider Magnesium if:

Pre-eclampsia with severe hypertension that does not respond to treatment or is associated with ongoing or recurring severe headaches, visual scotomata, nausea or vomiting, epigastric pain, oliguria and severe hypertension, as well as progressive deterioration in laboratory blood tests such as rising creatinine or liver transaminases or falling platelet count, or failure of fetal growth or abnormal doppler findings.

If fitting start Magnesium 4g IV over 10 minutes followed by an infusion at 1g per hour.
Call for help and move to the Eclampsia algorithm.

## DRUG DOSES:

Oral antihypertensives
Labetalol: 200mg po stat, can be repeated at 30 mins if no response
Nifedipine: 10mg MR orally (BP to be taken every 10 mins for ½ an hour as nifedipine can lead to a marked drop in BP)

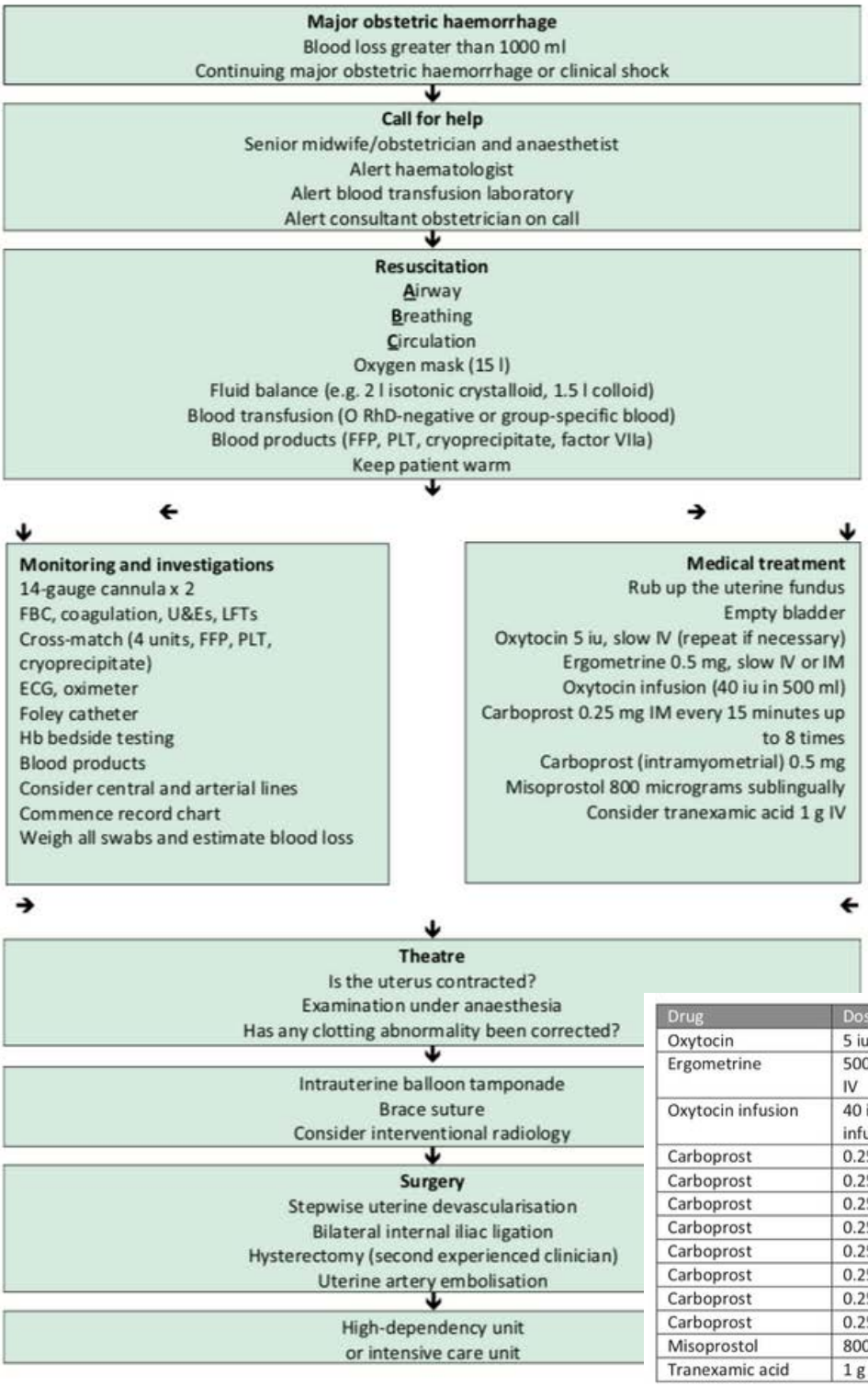
IV antihypertensives
Labetalol: 50mg bolus over 1 minute, (can be repeated after 5 mins up to a maximum of 200mg)If IV infusion needed: start at 20mg/hour, can be doubled every 30 mins up to a maximum of 160mg/hour
Hydralazine: Use if severe asthma but can drop BP, (consider giving 500ml Crystalloid before or as giving 1st dose hydralazine)

IV Magnesium IV loading dose of 4g over 5 to 15 minutes, followed by an infusion of 1 g/hour maintained for 24 hours.

**REF:**
Hypertension in pregnancy: diagnosis and management. NICE guideline Published: 25 June 2019
www.nice.org.uk/guidance/ng133

**Appendix III:** A flow chart of the different steps for the management of major PPH

**Resuscitation, monitoring, investigation and treatment should occur simultaneously**




| Drug | Dose | Time |
|---|---|---|
| Oxytocin | 5 iu slow IV | |
| Ergometrine | 500 micrograms/1 ampule (if normal BP) IM IV | |
| Oxytocin infusion | 40 iu in 500 ml physiological saline IV via infusion pump at 125 ml/hour | |
| Carboprost | 0.25 mg IM (dose 1) | |
| Carboprost | 0.25 mg IM (dose 2) | |
| Carboprost | 0.25 mg IM (dose 3) | |
| Carboprost | 0.25 mg IM (dose 4) | |
| Carboprost | 0.25 mg IM (dose 5) | |
| Carboprost | 0.25 mg IM (dose 6) | |
| Carboprost | 0.25 mg IM (dose 7) | |
| Carboprost | 0.25 mg IM (dose 8) | |
| Misoprostol | 800 micrograms SL or 1000 micrograms PR | |
| Tranexamic acid | 1 g IV | |

**Abbreviations:** **ECG** electrocardiogram; **FBC** full blood count; **FFP** fresh frozen plasma; **Hb** haemoglobin; **IV** intravenous; **IM** intramuscular; **LFTs** liver function tests; **PLT** platelets; **PPH** postpartum haemorrhage; **RhD** rhesus D; **U&Es** urea and electrolytes.

| Initial management | Time |
|---|---|
| Oxygen given | |
| Bed head down | |
| IV cannula no. 1 | |
| IV cannula no. 2 | |
| | |
| **Further interventions** | **Time** |
| Transfer to theatre | |
| Intrauterine balloon tamponade | |
| Brace suture | |
| Interventional radiology called | |
| Stepwise uterine devascularisation | |
| Bilateral internal artery ligation | |
| Hysterectomy | |

**REF:**
Mavrides E, Allard S, Chandraharan E, Collins P, Green L, Hunt BJ, Riris S, Thomson AJ on behalfof the Royal College of Obstetricians and Gynaecologists. Prevention and manag ement of postpartum haemorrhage.BJOG 2016;124:e106–e149

## Investigations:

D dimer - only after assessment of clinical probability do not wait for this in unstable patients, however if negative consider alternative diagnosis
CTPA
VQ (renal compromise/young/breastfeeding/pregnant but NOT if likely Covid)
POC ultrasound (ECHO)
ECG

## THROMBOLYSIS

Thrombolysis is the first line treatment for massive PE and may be instituted on clinical grounds alone if cardiac arrest is imminent.
Invasive approaches (thrombus fragmentation and IVC filter insertion) should be considered where facilities and expertise are readily available or if thrombolysis contraindicated.

**Massive PE:** Defined as - collapse/hypotension, hypoxia, engorged neck veins, RV strain and can be diagnosed with CTPA or ECHO + ECG

## Contraindications

| Absolute | Relative |
|---|---|
| Prior intracranial haemorrhage | Severe uncontrolled HTN (SBP >180, DBP >110) |
| Known cerebral neoplasm | >10 mins CPR |
| Ischaemic stroke <3 months | Hx of ischaemic stroke > 3 months |
| Suspected aortic dissection | Recent internal haemorrhage |
| Active bleeding/bleeding diathesis | Non compressible vascular puncture |
| Significant trauma <3 months | Pregnancy |
| | Active peptic ulcer |
| | Current use of anticoagulants |

## Dosing guidance

**PE causing cardiac arrest or peri-arrest:**
50mg IV bolus alteplase over 1-2mins (See ALS Algorithm)
**Massive PE but not peri-arrest:**
Alteplase 10mg bolus over 1-2mins then 90mg over 2hrs
If pt less than 65kg do not exceed 1.5mg/kg, but initial 10mg bolus remains unchanged

**Submassive PE** (PE + RV dysfunc +/- myocardial injury but without hypotension)**:**
No evidence for thrombolysis, unless multiple adverse prognostic indicators - discuss individual cases with resp or cardio if concern.
(Usually started on an unfractionated heparin infusion.)

**REF:**
https://thorax.bmj.com/content/58/6/470

# PULMONARY OEDEMA

## Basics:

Sit patient up
Put on high flow 02 if sats <95% or pt SOB (can reduce in COPD)

## Goals:

improve oxygenation
Maintain BP
Address underlying cause

## Best evidence:

GTN infusion (if BP >90), can start S/L nitrates if IV access not established, then start IV infusion at 10-20mcg/min, increasing every 3-5 minutes by 5-10mcg/min as BP allows

CPAP (ensuring CXR before starting)

Furosemide only if fluid overloaded
- 20-40mg IV; consider higher doses in those already on regular frusemide
- takes at least 1 hour to have diuretic effect

If no improvement, inotropes (dobutamine)

Consider dialysis if renal failure

**REF:**
Taken from: RCEM learning CPO

# RAPID TRANQUILISATION

## INDICATIONS:

Acute Behavioural Disturbance; combination of delerium, severe agitation, aggressive behaviour, autonomic dysfunction, hyperthermia.

## AIM:

Rapid sedation to allow investigation and treatment.High risk of death; from metabolic acidosis, rhabdomyolysis, multi-organ failure, DIC and arrhythmias. Risks increase the longer a patient is held in restraints.

## SEDATION:

Ensure adequate staff and equipment (move to resus, check airway equipment, get enough staff, ensure the right staff; security, anaesthetics, ICU etc)
Benzodiazepines are 1st line, RCEM recommends ketamine as 2nd line and avoidance of haloperidol if possible due to increased risk of arrhythmia.
If an RSI is required: avoid even short periods of apnoea as can lead to an increase in acidosis and arrhythmias.

## MONITORING:

Requires treatment in resuscitation area and may require assistance from ICU/anaesthetics.

## BASELINE INVESTIGATIONS:

Core temperature, Full set of observations, VBG, ECG, FBC, Clotting, U+E, LFT, Calcium, CK, TFT, Glucose +/- CT Head.

## TREATMENT:

Treat acidosis, rhabdomyolysis, active cooling if temperature above 39C (avoid paracetamol if hyperthermic).
Substance abuse commonest cause but actively search for other causes including head trauma, sepsis, meningoencephalitis, alcohol or GHB withdrawal and electrolyte abnormalities.

## DRUG DOSES:

**Always use drugs you are familiar with**, if confident ketamine may provide a more predictable response.

Half initial dosing in the elderly (>65) or in naive to antipsychotic medications (consider a quarter of doses in the elderly and titrate slowly).

| Medication | Dose (mg) | Onset (variable) | Duration (mins) |
|---|---|---|---|
| **IV** | | | |
| **Lorazepam** | 2-4mg | 2-5 mins | 60-120 |
| **Midazolam** | 2-5mg midazolam, bolus every 2 minutes up to 10mg total | 1-5 mins | 30-60 |
| **Ketamine** | 1mg/kg ketamine in divided doses over 2 minutes and consider RSI and anasthetic support if rpt dose needed | 1 min | 60-90 |
| **IM** | | | |
| **Olanzapine** | 10 mg olanzapine IM if ?psychosis and no features of neuroleptic malignant syndrome or if IV/IM midazolam has not worked | | |
| **Ketamine** | 2-4mg/kg ketamine up to 400mg and repeat at 5 minutes if no effect | 3-5 mins | 60-90 |
| **Lorazepam** | 4mg | 15-30 mins | 60-120 |
| **Midazolam** | 5-10mg midazolam IM | 10-15 mins | 120-360 |

**REF:**
Taken from: RCEM learning session ABD

# RESUSCITATIVE HYSTEROTOMY

**Indications**

MATERNAL CARDIAC ARREST

Cardiac arrest in pregnancy - (gestation >24/40 or fundus at/above umbilicus)

Purpose of procedure is to save the mother

If done within 4 minutes of arrest there is a higher likelihood foetus will survive

**CALL FOR HELP - Obstetrics/Paediatrics**

**Equipment**

**MOTHER**

| Essential | Useful |
|---|---|
| #10 Scalpel | Betadine |
| Scissors (blunt end) | Wall Suction |
| Cord Clamps | Face Mask |
| Double Glove | Apron |

'C-Section or Thoracotomy Tray'

**BABY**

Resuscitaire (turn on)
Warm Towels
Baby Hat
Neonatal BVM
Neonatal Resus Equipment

**Team Allocation**

**MATERNAL ALS**

Normal ALS principles
Earlier than normal intubation
Displace uterus to left side
Continue ALS throughout

**HYSTEROTOMY**

Start to prepare at outset
See image and steps overleaf

**NEONATAL RESUS**

Resuscitaire
Warm towels + hat
Resus Equipment

**Remember**

'SLOW IS SMOOTH, SMOOTH IS FAST'

Take a deep breathe

Success will depend on the 3 independent teams focusing on their roles

GRI ED 2017

**STEP ONE**

**GET INTO ABDOMEN**

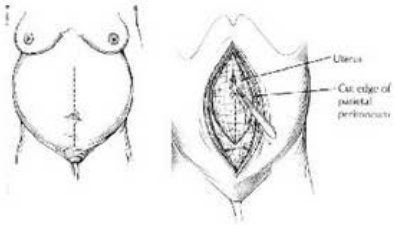
Midline vertical incision with scalpel from fundus to pubis though skin and fat

(Ideally avoid the umbilicus)

Cut through the peritoneum and extend vertically with blunt-ended scissors

Uterus will lie immediately below peritoneum

Use retractors if available - otherwise assistant's gloved hands




**STEP TWO**

**GET INTO UTERUS**

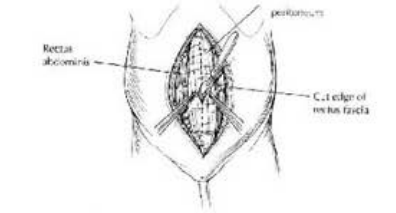
Make cut in lower portion of uterus with scalpel

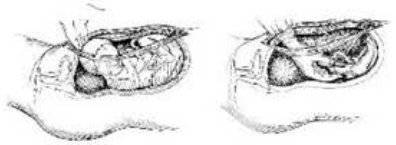
Use scissors to extend vertically to fundus

(can push baby away with fingers)

If placenta in way - cut through it

Likely a lot of fluid at this stage



**STEP THREE**

**GET BABY OUT**

Insert hand inside and find foetal head (likely breech position if preterm)

Deliver head and baby will follow

Fundal pressure to assist

**STEP FOUR**

**CORD & PLACENTA**

Clamp and cut cord immediately and hand baby to neonatal resus team

Scoop placenta out while applying cord traction

Give syntocinon 10IU IV

**STEP FIVE**

**Pack wound with towels/packing**
**Await obstetrician or surgeon**

Close with locking suture if able

REF:
https://stmungos-ed.com/obstetrics/hysterotomy

# SEDATION

- Minimal vs moderate vs deep vs general vs dissociative
- ED sedation should be minimal or moderate.
- The patient should not lose the airway unless this is planned and involves anaesthetic assistance by ED or by the anaesthetic / ITU team.
- Ketamine sedation falls under the deep category due to its potential complications but can be safely used in resus.
- Any sedation must involve an experienced and trained clinician who is signed off for the procedure.
- Monitoring and facilities required: ECG, oximetry, capnography, BP, difficult airway trolley, 02, suction, trolley that can be tipped, IV access, IV fluids, sedation proforma
- Patients should not be discharged until they are at baseline level of consciousness with normal observations.
- Fasting - not needed for minimal sedation (entonox) but should be 2 hours clear fluids and 6 hours solids for moderate and onwards. The fasting rule may need to be adjusted if the procedure is urgent (eg cardiovascular compromise, limb ischaemia).

## DRUG OPTIONS:

**Entonox:** Can cause nausea, not for prolonged periods of time

**Morphine:**
**Vial** = 10mg/10ml
**IV dose** = 0.05-0.01mg/kg
Onset 5-10 minutes, Duration 2-4 hours
**SE:** respiratory depression, nausea, hypotension, pruritus

**Fentanyl:**
**Vial** = 500mcg/10ml OR 10mcg/2ml - both 50mcg/ml
**Draw up** 10mcg/ml - 10ml syringe with 2mls Fentayl + 8mls N. Saline
**IV dose** = 0.5-1mcg/kg. Give 0.5mcg/Kg bolus and then additional 25mcg boluses
Onset about 1 min, Duration 30-60 mins
**SE:** Respiratory depression, apnoea and pruritus

**Midazolam:**
**Vial** = 1mg/ml or 10mg/2mls
**Draw up** 1mg/ml - 10mg in 10mls
**IV dose** = 1-5mg. Give 1-2mg boluses for amnesia/anxiolysis, 3-8mg for sedation, titrate in 1mg boluses, give slowly over 2 mins. REDUCE DOSE IN ELDERLY
Onset 2-5 mins, Duration 20-120 mins
**SE:** Hypotension, respiratory depression, prolonged effect after procedure over, cation in elderly

**Propofol:**
**Vial** = 10mg/ml
**Draw up** 2 x 10ml syringes of 10mg/ml
**IV dose** Start with a 0.5mg/kg bolus and top up with 10mg (1ml) blouses as needed
Onset 30 secs, Duration 3-8 mins
**SE:** Hypotension and respiratory depression

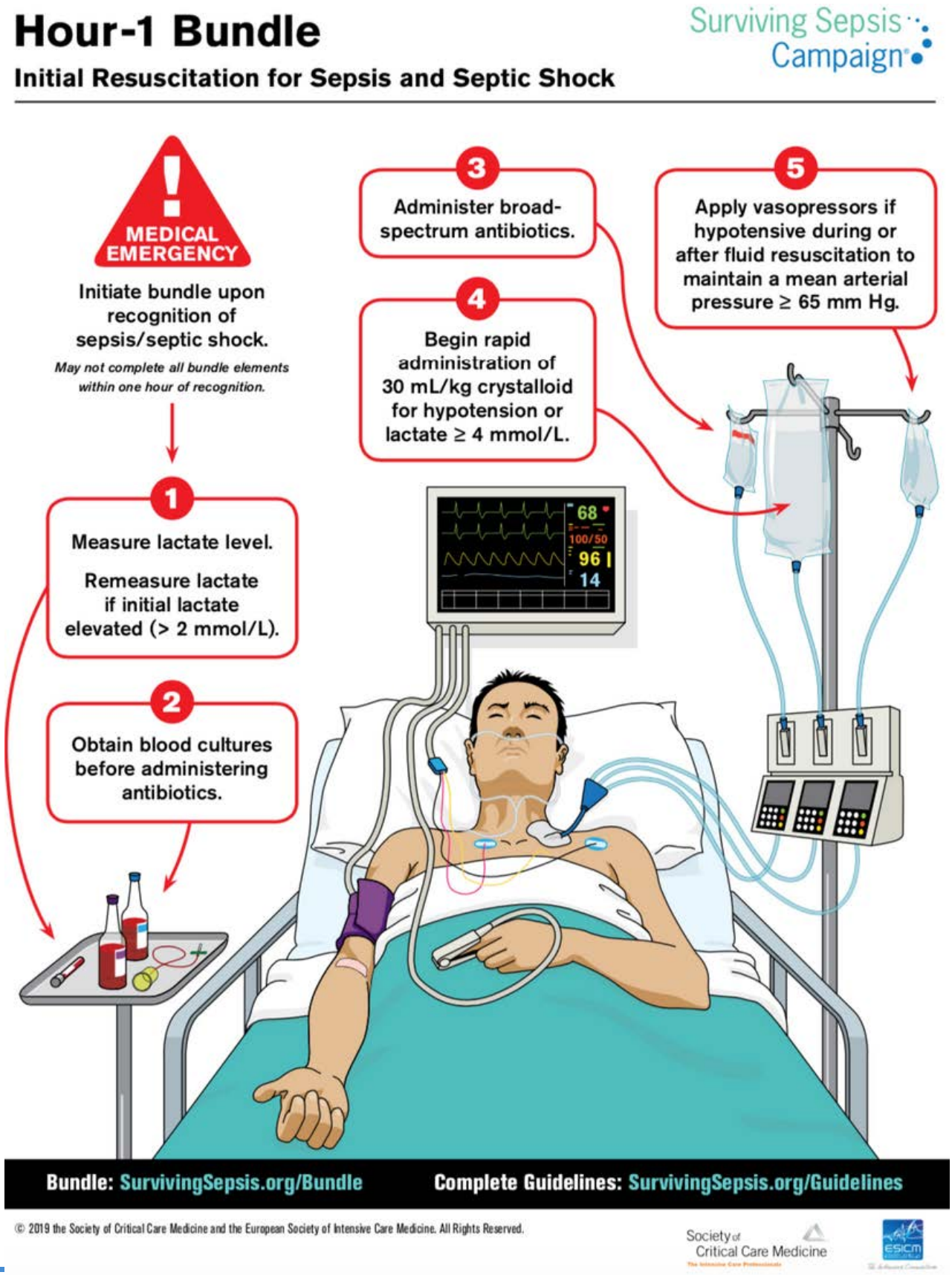
**Ketamine:**
**Vial** = 500mg/10mls (50ml/kg)
**Draw up** in a 10ml syringe, 2ml ketamine + 8mls N. Saline to give 10mg/ml
**IV dose** = 0.5-1mg/kg. Given 0.5mg/kg with an additional 10mg bolus every 2 mins up to 1mg/kg
Can combine with midazolam 1-2mg to reduce emergence phenomenon.
Onset 30 secs, Duration 5-10 mins,
**SE:** Secretions may cause laryngospasm, tachycardia, hypertension, agitation/emergence (avoid in psychosis)

NB: Can use ketofol if trained in its use (half doses of each of ketamine and propofol in combination)

## COMPLICATIONS:

Laryngospasm: 02, BVM with PEEP, deepen sedation/proceed to RSI
Apnoea: 02, jaw thrust/BVM
Hypotension: usually transient, IV fluid bolus, metaraminol (0.5-1mg boluses)
Hypoxia: 02, support breathing
Bradycardia: atropine 500-600mcg bolus

**REF:**




## DRUG DOSES:

Antibiotics: Check microguide for appropriate choice

**REF:**
https://www.sccm.org/getattachment/SurvivingSepsisCampaign/Guidelines/Adult-Patients/Surviving-Sepsis-Campaign-Hour-1-Bundle.pdf?lang=en-US

# STATUS EPILEPTICUS

## Definition

Any seizure activity that is prolonged for more than 5-10 minutes or >2 seizures without full recovery

## Management

### 0-5mins

Airway: Recovery position, suction externally (never insert anything into the mouth)
Breathing: High flow o2
Circulation: IV Access, ECG tracing, VBG: look for reversible causes (electrolytes, glucose)
Disability: GLUCOSE, check pupils, consider CT head, pabrinex if withdrawal seizures (after glucose corrected if relevant)

Give dose Benzodiazepines:

- IV: Lorazepam 2-4mg (or Diazepam 5-10mg or Midazolam 2-4mg)
- PR: Diazepam 10-20mg
- Buccal: Diazepam 10mg
- IM: Midazolam 10mg

If no effect give 2nd dose benzo's after 10 mins

### 10-15 mins

Start additional treatment:
Levetiracetam 20mg/Kg IV over 15 minutes (can give up to 2-4g if required)
Or
Phenytoin 20mg/kg IV, max 50mg/minute

### 15-20 mins

If still seizing contact ICU for consideration/preparation intubation
Consider intubation earlier if airway concerns or profound metabolic acidosis

**REF:**

# STROKE

**If signs/symptoms suggestive of an acute stroke and onset under 4hrs:**
Blue light to nearest stroke unit (National Hospital for Neurology and Neurosurgery @ Queens Square)
Once ambulance booked **contact HASU 07753 739286**

**If onset 4-72 hrs:**
Arrange CT head and investigation in ED but d/w HASU via referapatient (may accept patients within 72hrs of a stroke for ongoing management at stroke unit).

**If onset over 72hrs (or patient not for transfer to HASU):**
D/w neurology or medics at the RFH

**Initial management:**
A-E assessment
Check Glucose
Manage hypertension carefully

**If signs and symptoms resolve follow TIA pathway**

**REF:**

# THORACOTOMY

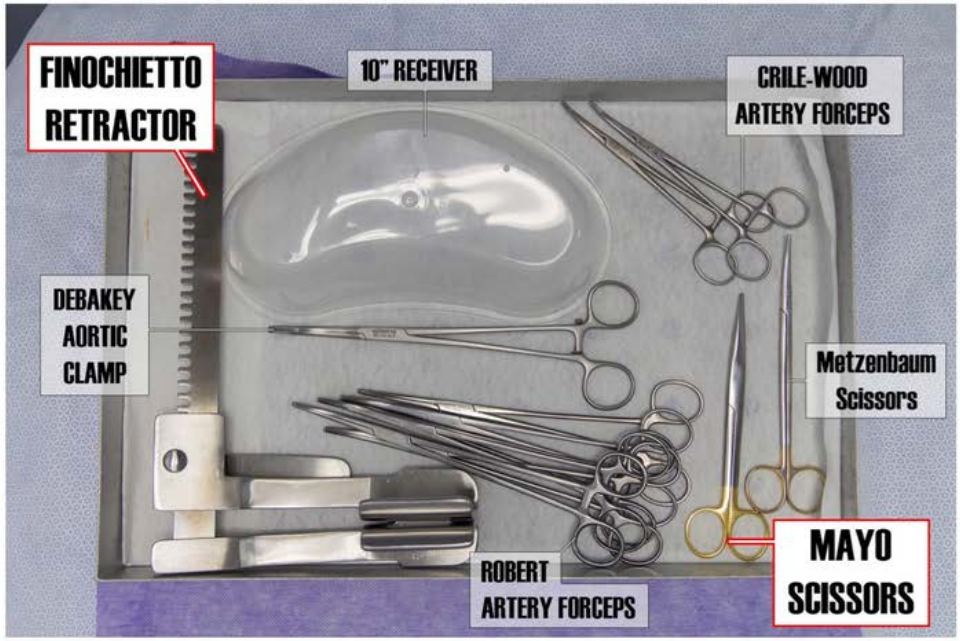
**HOW TO GET IN TO THE CHEST**

**WHEN TO DO**

Penetrating chest trauma = pulseless but signs of life (or <10mins since arrest):
- Brainstem Reflexes e.g. pupils reactive, gag-reflex intact
- Spontaneous ventilation or limb movement
- Positive rhythm on ECG (PEA)
- Ultrasound = cardiac motion or pericardial effusion (absence of both = 0% survival)

In BLUNT TRAUMA it is probably best reserved for those who arrest in department
Try the following first:
(1) Intubate and ventilate
(2) Bilateral finger thoracostomies (rule out tension)
(3) Large bore access and 1-2Litres of fluids (ideally blood)
(4) Ultrasound - a beating heart or pericardial effusion would be an indication to do thoracotomy

## BASIC THORACOTOMY TRAY




Will also need a **SIZE 22 SCALPEL**, a standard **SUTURE PACK** and a pair of sterile **TUFF CUT SCISSORS**

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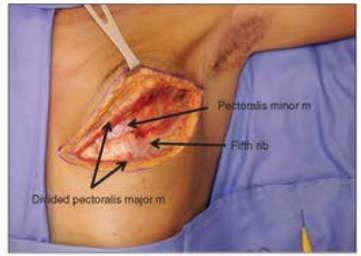
**SECOND TEAM** - continue with resuscitation
- Intubate and go deep (26cm) to intubate right main bronchus (deflate left lung which helps thoracotomy)
- Venous access (e.g. right subclavian or right humeral IO)
- Fluid Resuscitation (massive transfusion protocol)
- Right-sided chest drain

**Step 1**

Put on face-mask and double-glove
'Baptize' with betadine (if time)
Assistant can hold left arm out of the way
Take scalpel (22) and incise from sternum to bed
- Below left breast/pectoral muscle
- Follow natural curve of ribs upwards towards axilla

3 cuts: skin, sub-cut tissue and fat




**Step 2**

Take MAYO Scissors
At anterior axillary line - push bottom blade through muscle (blunt) then cut to sternum
- Could use index finger of other hand to push lung away as you cut

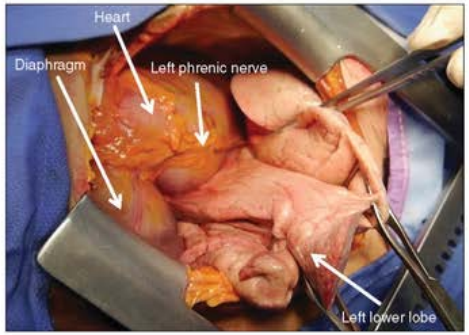
Repeat at same point but directed to bed


**Step 3**

Spread ribs initially with your hands
- Will be tight and hard to insert blades of retractor

Take Fionochietto Retractor and insert blades between ribs
- Crossbar towards bed to allow for later clamshell if needed

Rotate handle to open (At least 8-10 inches)
- Expect to hear ribs cracking




Lung should pop up
Push it down and up into chest (will deflate)

Diaphragm can be confused with heart
**HEART**:
Can place hands around it
Has a pericardial 'skin'
Lies underneath the sternum

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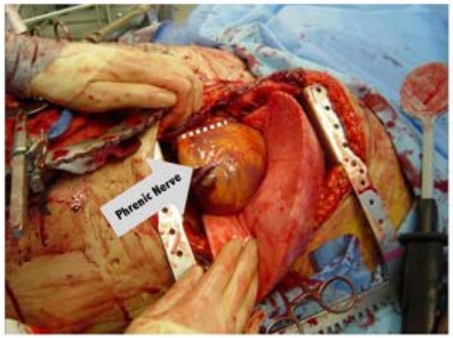
**REF:**
Taken from St Mungo's:https://stmungos-ed.com/surgical/thoracotomy

# THORACOTOMY

**WHAT TO DO INSIDE THE CHEST**

## RELIEVE TAMPONADE

The mainstay for Emergency Doctors




Use tweezers (or haemostats) to lift up pericardium medially next to/under the sternum

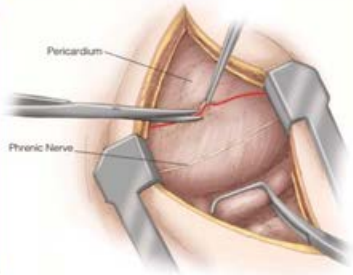
Phrenic nerve lies LATERALLY

Use small pair of scissors to open a hole in pericardium

If not Tamponade go to next step ('control intrathoracic haemorrhage')

Extend incision vertically (head-to-toe) with fingers and pull pericardium off heart

If no wound immediately found = do a CLAMSHELL




### CLAMSHELL

Extend skin incision across sternum then repeat symmetrical lateral thoracotomy on right side
Open sternum with sternal saw or trauma shears
Use scissors to cut remaining muscle/vessels
Reposition rib spreader at sternum

### IF BLEEDING POINT FOUND:

Put a finger ON (not in) the hole and wait for surgeon

Hard to stitch

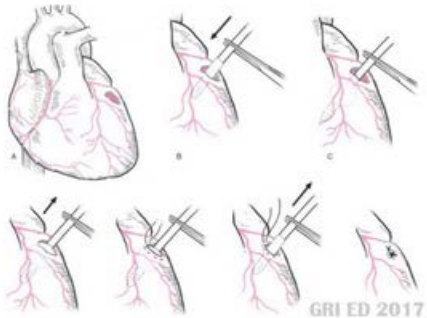
Use a foley catheter if large wound (>1cm):

Insert through wound + inflate with SALINE (<10mls)

Retract gently and clamp with artery forcep (prevent blood loss)

Drugs and Fluids could be administered through the catheter

If appropriate expertise: consider stitching - minimum number; interrupted; non-absorbable 0/0 or 1/0



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## CONTROL INTRATHORACIC HAEMORRHAGE

Without cardiothoracics survival is very limited

### PULMONARY HAEMORRHAGE

#### TAMPONADE HILAR VESSELS

Push lung down and find hilum

Place hands around hilum and squeeze

Could use a Robert Artery Forcep to clamp (see Mr Dickson Tray image)

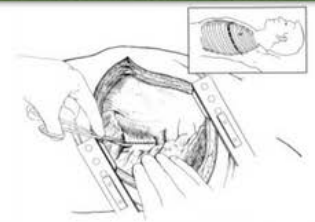
Or

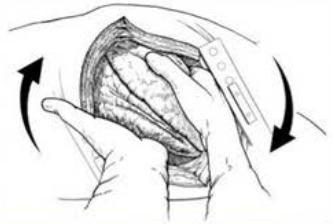
Crush lung down and find thin fibrinous structure between heart and lung (with no vessels)

This is the INFERIOR PULMONARY LIGAMENT

Cut with Metzenbaum Scissors

Then take entire lung in both hands and twist 180⁰



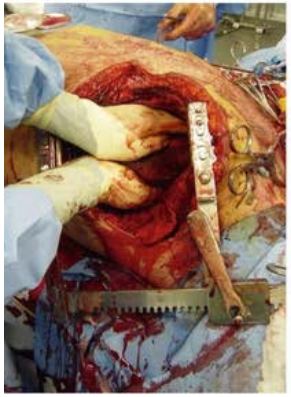


### INTERCOSTAL VESSEL HAEMORRHAGE

Locate any bleeding around lung and compress with gauze
Continue resuscitation and await the surgeons

### GREAT VESSEL BLEEDING

Out of ED capability to treat



## CPR + HAEMODYNAMIC AUGMENTATION

#### WHEN BLEEDING CONTOLLED:

**OPEN CHEST CPR**: one hand above and below heart then bring together (clapping)

**INTERNAL DEFIBRILLATION**: start at 10J

**AORTIC CROSS CLAMP**: too challenging for ED staff

If procedure successful:
Control bleeding (internal mammary and intercostal vessels) with artery forceps
Patient may wake up so prepare anaesthesia
ARRANGE THEATRE FOR DEFINITIVE REPAIR

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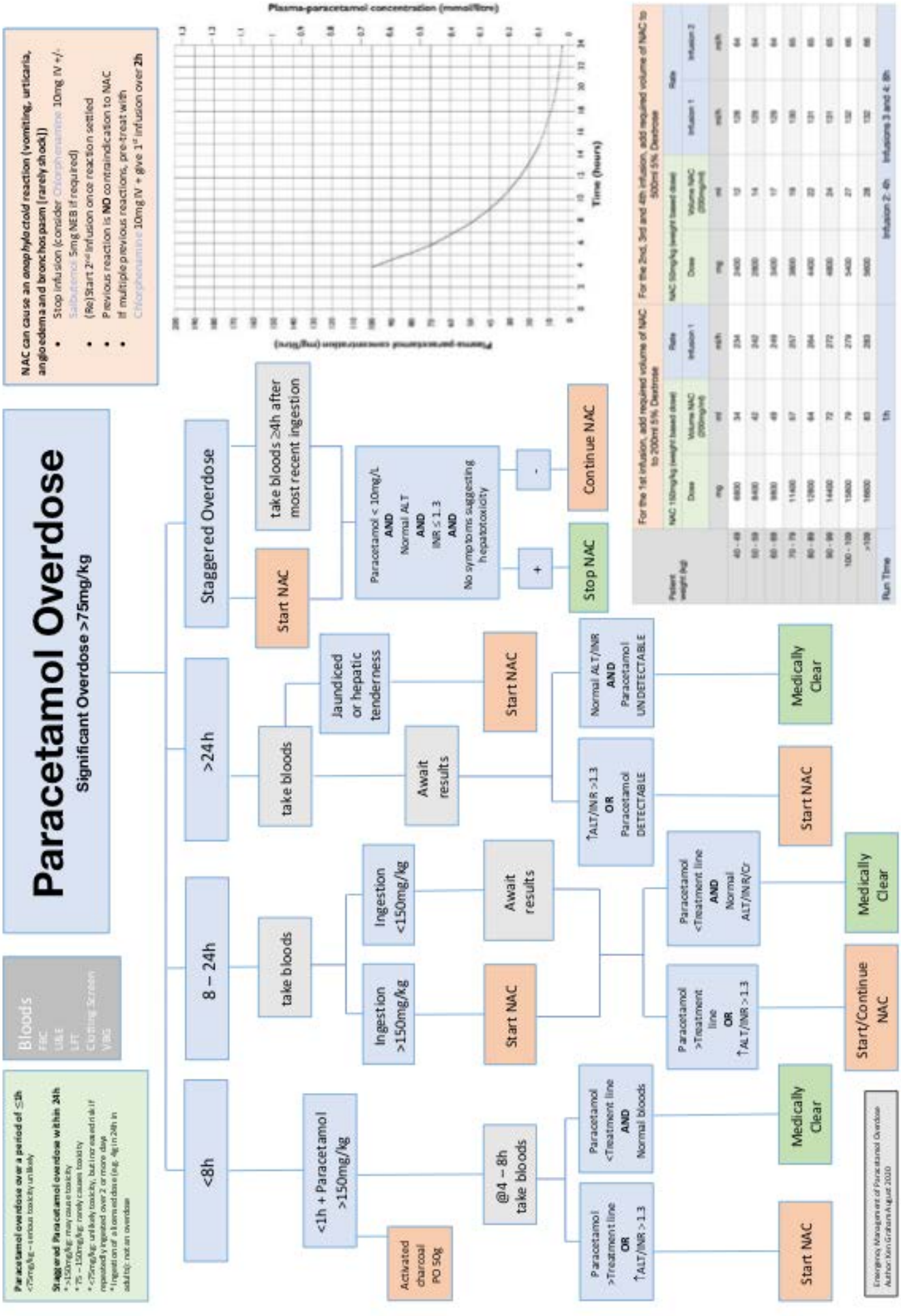
**REF:**
Taken from St Mungo's:https://stmungos-ed.com/surgical/thoracotomy



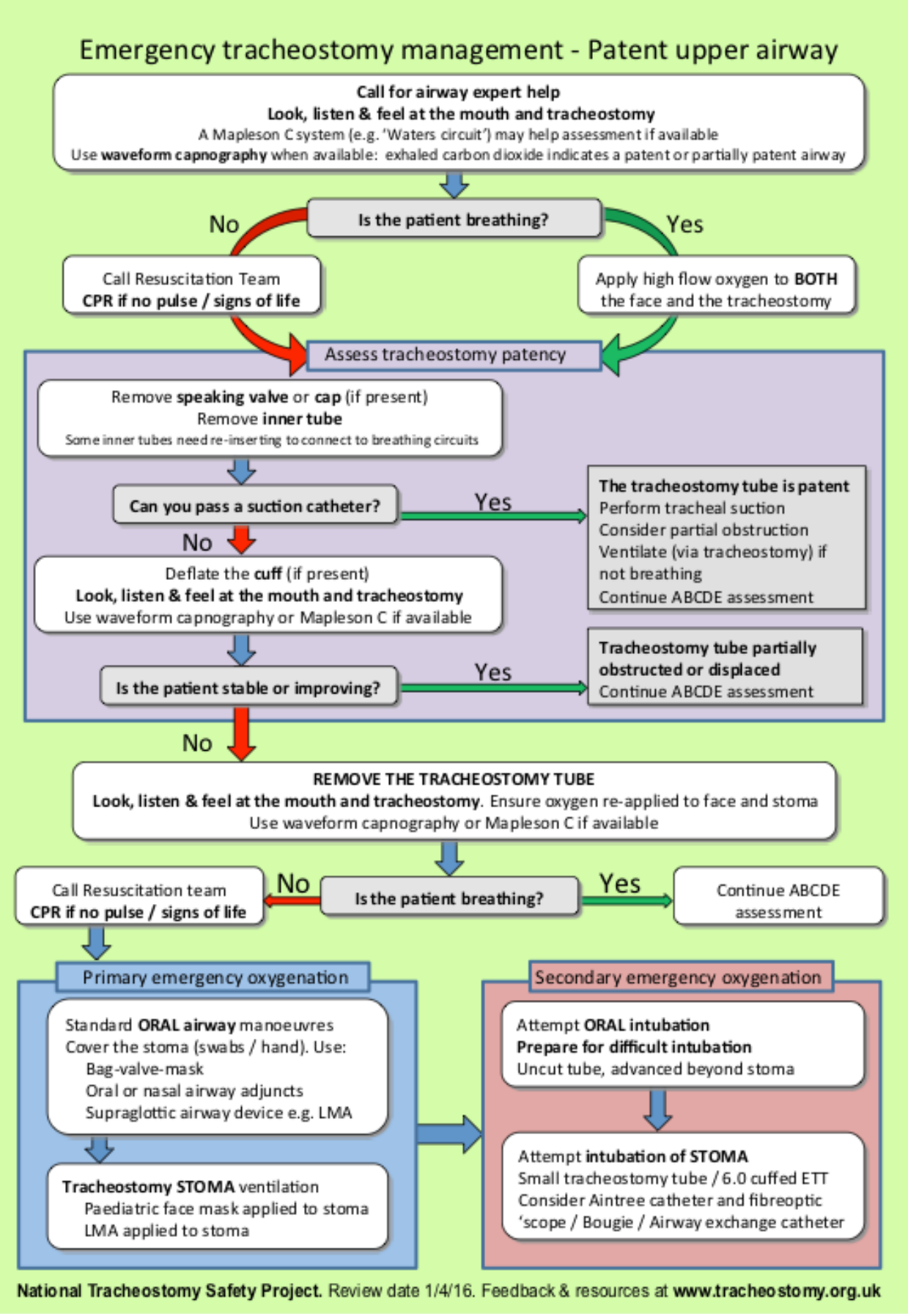

REF:
Author: Dr Ken Graham, ED

| | | |
|---|---|---|
| **Aspirin** | >125mg/kg<br><br>Salicylate levels:<br>MILD <300mg/L<br>MOD 300–700mg/L<br>SEVERE >700mg/L | Salicylate Levels: >2h symptomatic >4h asymptomatic<br>VBG: mixed respiratory alkalosis + metabolic acidosis<br><1h: Activated Charcoal (50g PO)<br>IVFluids + Potassium if often necessary<br>NaHCO3 (500ml 1.26% over 20 – 60mins)<br>• metabolic acidosis OR<br>• >500mg/L (aim urine pH > 7.5)<br>Haemodialysis (>700mg/L + acidosis, coma) |
| **ßblocker** | Bradycardia<br>Hypotension<br>Reduced GCS | <1h: Activated Charcoal (50g PO)<br>IVFluids (1 – 2L)<br>Atropine 1mg IV/Pacing (unlikely efficacy)<br>High Dose Insulin: bolus; 1U/kg + 2 amps D50W, infusion; start 1(<8-10)U/kg/h + 5ml/kg/h D10W<br>(consider Glucagon [ 5 – 10mg IV])<br>Inotropes and Vasopressors |
| **CaChB** | Bradycardia<br>Hypotension<br>Normal GCS | <1h: Activated Charcoal (50g PO)<br>IVFluids (1 – 2L)<br>Calcium Gluconate (10ml 10% over 5 mins)<br>Atropine (1mg IV)/Pacing (unlikely efficacy)<br>High Dose Insulin (see above)<br>(consider Glucagon [5 – 10mg IV])<br>Intralipid (see LA management for dosing)<br>Inotropes and Vasopressors |
| **Citalopram** | >2mg/kg<br><br>SSRI<br>^cardiotoxicity | ECG: Mg (2g IV over 15mins) if prolonged QT<br>Seizures/Agitation: BZD<br>Hyperthermia: fan > ice-pack (groin/axillae) > ice-baths > Dantrolene (1mg/kg)<br>Serotonin Syndrome (Cyproheptadine 12mg PO/NG) |
| **Cocaine** | | See Sympathomimetic Toxidrome |
| **CO** | | VBG; check COHb, >30% severe poisoning<br>If severe lactic acidosis (>7mmol/L) consider Cyanide co-poisoning<br>Oxygen NRB |
| **Cyanide** | Highly Toxic<br><br>Cyanide levels;<br>MILD <1mg/L<br>MOD 1-3MG/L<br>SEV >3mg/L | VBG: severe lactic (>7mmol/L) acidosis, high pvO2<br>Oxygen<br>IVFluids<br>NaHCO3 (500ml 1.26% over 20–60mins)<br>Hydroxycobalamin 5g over 15mins, likely rpt dose req. |
| **Digoxin** | Not taking Digoxin: >20mcg/kg<br>Digoxin Tx: >3x daily dose | IVFluids<br>Atropine (1mg IV)<br>DigiFab (2 vials, repeat 45mins): ventricular or unstable atrial dysrhythmias OR hyperkalaemia (>5mmol/L) OR renal failure OR high digoxin levels (>4mcg/L) OR BB/CaChB co-ingestion |
| **Ethylene Glycol/ Methanol** | Converted to toxic metabolites<br><br>High osmolar gap → high anion gap acidosis | Block formation of toxic metabolites:<br>Fomepizole(15mg/kg) OR EtOH (100ml 40% Vodka PO) if unavailable<br>Correct acidosis to >pH 7.2: (NaHCO3 500ml 1.26%)<br>Dialysis: acidosis + end organ damage OR Methanol > 15mmol/L OR EG > 6mmol/L<br>(EG; Pabrinex, Methanol: Folic Acid, metabolism of toxins) |
| **GHB** | | Supportive management<br>Consider Naloxone (400mcg IV)<br>Normally airway patent (intubation if risk of soiling) |
| **Iron** | ELEMENTAL Iron<br>>20mg/kg - toxic<br>>75mg/kg – severe features likely<br>>150mg/kg severe features probable<br><br>PHASES;<br>GI disturbance<br>Latent phase<br>Shock<br>Hepatotoxicity | Measure serum Iron at 4 – 6h<br>VBG: acidosis persists during latent phase<br>IVFluids<br>Correct acidosis (NaHCO3 500ml 1.26%)<br>Desferrioxamine (15mg/kg/h IV): severe clinical features, metabolic acidosis OR serum Iron >3mg/L OR haemolysis of bloods<br>AXR will confirm presence of tablets - consider whole bowel irrigation due to risk of bowel necrosis |
| **LA** | Percutaneous:<br>Lidocaine >3mg/kg<br>Bupivacaine >2mg/kg | Intralipid 20%: 1.5ml/kg bolus → 0.25ml/kg/MIN infusion<br>Cardiovascular instability: Repeat bolus after 5mins x2<br>Hypotension: double rate of infusion<br>Bradycardia: Atropine<br>Seizures: BZD |
| **NSAIDs** | >400mg/kg<br>Low toxicity | <1h: Activated Charcoal (50g PO)<br>Supportive management - consider NaHCO3 if acidosis worsening |
| **Sertraline** | >7mg/kg<br>Low toxicity | Seizures/Agitation: BZD<br>Hyperthermia: fan > ice-pack (groin/axillae) > ice-baths > Dantrolene (1mg/kg)<br>Serotonin Syndrome (Cyproheptadine 12mg PO/NG) |
| **TCA** | **Anti-cholinergic**<br>**Na channel blocker**<br>**Alpha 1 receptor blocker** | 1h: Activated Charcoal (50g PO)<br>NaHCO3 (500ml 1.26% 20-60mins): acidosis OR QRS > 100ms<br>See anticholinergic toxidrome<br>If hypotension does not respond to NaHCO3;<br>Noradrenaline infusion (often high dose)<br>Intralipid (see LA management for dosing) |
| **Quetiapine** | >15mg/kg | Supportive management<br>Agitation/Seizures/Delirium: BZD |

| TOXIDROMES | HR + BP | Resp | Temp | CNS | Pupils | Skin | Bowel Sounds | ABCDE |
|---|---|---|---|---|---|---|---|---|
| **SYMPATHOMIMETIC**<br>Cocaine, MDMA, Amphetamines, Methamphetamine, Caffeine, Theophylline, LSD | ↑ | ↑ | ↑ | ↑ | ● | ☁ | ))) | **Benzodiazepines (BZD) are first-line treatment**<br>IV Diazepam 5-10mg/Midazolam 5-10mg/Lorazepam 1-2mg<br>**HTN**; BZD > GTN infusion (1-2mg/h) > Labetalol Infusion<br>**Hyperthermia**: fan > ice-pack (groin/axillae) > ice-baths > Dantrolene (1mg/kg)<br>**Hyponatraemia**: Hyper/euvolemia ⇒ fluid restrict<br>Na<120 + altered mental state/seizures ⇒ 3% HTS |
| **ANTI-CHOLINERGIC**<br>Atropine, Glycopyrronium, Ipratropium, Chlorphenamine, Diphenhydramine | ↑ | ⊘ | ↑ | ↑ | ● | 🌵 | ⊘ | **Aggressive Supportive Care**<br>**Agitation/seizures**: BZD (as above)<br>**Hyperthermia**: fan > ice-pack (groin/axillae) > ice-baths > Dantrolene (1mg/kg)<br>**Refractory**: Physostigmine 1-2mg **over 5 minutes**<br>(Contraindicated – QRS>100ms, HR <60, known epileptic) |
| **CHOLINERGIC**<br>Organophosphates, carbamates, nerve agents, Donepezil, Rivastigmine, Physostigmine, Pyridostigmine, Nicotine, Mushrooms | ⊘ | ⊘ | ⊘ | ↑↓ | • | ☁ | ))) | Atropine 2-4mg > DOUBLE every 5 minutes until patient is "atropinised" (HR > 80, BP stable, minimized secretions, lungs clear)<br>Pralidoxime ~2g (30mg/kg) in 100ml N/S over 30 mins > Infusion 0.5g/h (8mg/kg/h) [6g in 500ml N/S over 12h]<br>**Seizures**: BZD |
| **OPIOIDS**<br>Morphine, Heroin, Tramadol, Codeine, Methadone | ↓ | ↓ | ↓ | ↓ | • | 🌵 | ⊘ | **Oxygen/respiratory support**<br>Naloxone<br>**Acute OD**: 400mcg >1min> 800mcg >1min> 800mcg >1min> 2mg<br>**Risk of acute withdrawal**: 200mcg >1min> 100mcg >1min> 100mcg… aim for reversal of respiratory depression NOT unconsciousness |
| **SEDATIVE/HYPONOTICS**<br>Benzodiazepines, Barbiturates, Zopiclone, Baclofen | ↓ | ↓ | ↓ | ↓ | ⊘ | 🌵 | ⊘ | **Supportive Management**<br>**Iatrogenic OD**; consider Flumazenil 0.5mg >30s> 0.5mg >30s> 1mg<br>**DO NOT USE IN MIXED OVERDOSE** |

REF:
Author: Dr Ken Graham, ED

# TRACHEOSTOMY: EMERGENCY MANAGEMENT




## CALL FOR HELP EARLY:

**Call PAART (2525/2472) for any tracheostomy emergencies**

**Consider emergency call 2222**

**REF:**

# APPENDIX 1:
# BURNS GUIDELINES FROM THE LONDON AND SOUTH EAST ENGLAND BURNS NETWORK

# APPENDIX 2:
# TRAUMA GUIDELINES FROM TACTIC GROUP