

1-1 | Cardiac arrest management prior to team arrival

Cardiac arrest: the patient is unresponsive and is not breathing normally.

START

- ① **Confirm cardiac arrest:**
 - ▶ Give **5 effective ventilations**
 - ▶ If **no signs of life** commence **15 chest compressions:**
- ② **Call for help and request resuscitation trolley**
 - ▶ Check that the **resuscitation team** has been called
 - ▶ Call for **patient notes, drug charts, and observation charts**
- ③ **Apply defibrillation pads**
 - ▶ Apply self-adhesive electrode pads
 - ▶ **Minimise interruptions** to chest compressions
- ④ **Check rhythm when the defibrillator is connected**
 - ▶ If using an AED – follow its prompts, and continue to ⑤

Confirm if rhythm is shockable if trained to do so

 - ▶ If shockable → **GUIDANCE 1-2**
 - ▶ If non-shockable → **GUIDANCE 1-3**
- ⑤ **Start CPR again**
 - ▶ Check for signs of life after every 2 minutes
- ⑥ **Maintain airway and ventilation**
 - ▶ Give **100% oxygen** using bag-valve-mask ventilation
 - ▶ Apply **waveform capnography** monitoring to the airway when available
- ⑦ **Establish IV/IO access**
 - ▶ If IV access is present establish patency
 - ▶ If no IV access available IO
- ⑧ **Prepare a structured handover to the emergency team when they arrive**

Critical CHANGES

- If VF or pulseless VT → **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole → **NON-SHOCKABLE CARDIAC ARREST 1-3**

SIGNS of LIFE

- Swallowing
- Vocalising
- Normal limb movement
- Coughing
- Normal Breathing

During RESUSCITATION

- If you are by yourself continue CPR for 1 minute (15:2) and reassess, if no signs of life re-commence CPR with ventilations, ensure help is on its way.
- Correct CPR technique for **INFANTS** < 1 year:
 - encircling thumb technique (preferred)
 - Compress to 4 cm, allowing complete recoil
 - Repeat at a rate of 100-120 min⁻¹
- Correct CPR technique for **CHILDREN** > 1 year:
 - Place the heel of one hand on the lower half of the sternum with the other hand on top and interlock your fingers lifting fingers off the chest
 - Keep arms straight and position shoulders vertically over the patient
 - Compress to 5 cm allowing the chest to recoil afterwards
 - Repeat at a rate of 100-120 min⁻¹
 - Continue CPR 15:2
- Consider feedback device if available
- Consider using a CPR backboard if available (do not delay CPR)
- Consider inserting a supraglottic airway if trained to do so

Structured HANDOVER

- | | |
|--------------|---------------------|
| • Situation | • Background |
| • Assessment | • Recommendation(s) |

CONTACT NUMBERS

Resuscitation team:

• In-hospital	2222
• Out-of-hospital	999

Other useful numbers

1-2 | Shockable cardiac arrest (VF/pVT)

VF or VT on ECG with no pulse or signs of life. The key treatment is early defibrillation.

START

- 1 Confirm cardiac arrest and start CPR → GUIDANCE 1-1
- 2 Call for help and request resuscitation trolley
 - ▶ Check that the **resuscitation team** has been called
 - ▶ Call for **patient notes, drug charts, and observation chart**
- 3 Apply defibrillation pads
- 4 Check rhythm and pulse:
 - ▶ Change compressions-provider during check if possible
 - ▶ If shockable → go to step 5
 - ▶ If non-shockable → **GUIDANCE 1-3**
 - ▶ If return of spontaneous circulation → **post-resuscitation care**
- 5 Deliver safe shock:
 - ▶ Select **4J kg⁻¹** and charge the defibrillator
 - ▶ Give **chest compression whilst charging**
 - ▶ **Stop** compressions to deliver shock
 - ▶ Start **2 minutes** of CPR **immediately** after delivery
- 6 Maintain airway and ventilation
 - ▶ Give **100% oxygen** using bag-valve-mask ventilation
 - ▶ Insert **supraglottic airway –or– tracheal tube** if trained to do so
 - ▶ Apply **waveform capnography** monitoring to the airway
- 7 Check if drug treatment is needed
 - ▶ Give **adrenaline** after 3rd shock, then repeat every 3-5 minutes
 - ▶ Give **amiodarone** after 3rd and 5th shocks
- 8 Check for and treat **reversible causes**
- 9 After 2 minutes → go to step 4

DRUG DOSES and Treatments

Adrenaline	10 micrograms kg ⁻¹ (0.1 mg kg ⁻¹ IV / IO)
Amiodarone	5 mg kg ⁻¹ IV / IO after 3rd shock –repeat– 5 mg kg ⁻¹ IV / IO after 5th shock

Critical CHANGES

- If PEA or asystole → **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If K⁺ > 7 mmol L⁻¹ → **SEVERE HYPERKALAEMIA 3-5**

During RESUSCITATION

- 15 compressions to 2 rescue breaths, 100-120 min⁻¹, depth one third chest allow the chest to rise again completely (chest recoil)
- Continuous compressions once airway secured
- Aim for ETCO₂ of 2.0 kPa with CPR
- Check for reversible causes → **ASSESSMENT OF REVERSIBLE CAUSES DURING CARDIAC ARREST 1-4**

Reversible CAUSES

Hypoxia	Tamponade – cardiac*
Hypovolaemia	Toxins
Hypo/hyperkalaemia & metabolic	Thrombus – coronary or pulmonary*
Hypothermia	Tension pneumothorax*
*Point of Care Ultrasound to assist in diagnosis (POCUS)	

POST-RESUSCITATION CARE

- Check ABCDE, blood glucose, ABG, U and E, FBC and, CXR
- Full set of clinical observations
- Aim for SpO₂ 94-98%, normal PaCO₂ – 4.5-6.0 kPa
- Temperature control
- Treat precipitating cause
- Consider transfer of patient to a critical care setting

1-3 | Non-shockable cardiac arrest (PEA or Asystole)

Asystole, PEA or Bradycardia HR < 60 min⁻¹. Unconscious patient with no signs of life: The key treatment is early CPR.

START

- ➊ **Confirm cardiac arrest and start CPR → GUIDANCE 1-1**
- ➋ **Call for help and request resuscitation trolley**
 - ▶ Check that the **resuscitation team** has been called
 - ▶ Call for **patient notes, drug charts, and observation charts**
- ➌ **Apply defibrillation pads**
 - ▶ Apply self-adhesive electrode pads
 - ▶ **Minimise interruptions** to chest compressions
- ➍ **Check rhythm and pulse:**
 - ▶ If non-shockable → go to step ➎
 - ▶ If shockable → **GUIDANCE 1-2**
 - ▶ If return of spontaneous circulation → **post-resuscitation care**
- ➎ **Start CPR again**
 - ▶ Check for signs of life after every 2 minutes
 - ▶ Change compressions-provider during 2 min check if possible
- ➏ **Maintain airway and ventilation**
 - ▶ Give **100% oxygen** using bag-valve-mask ventilation
 - ▶ Insert **supraglottic airway –or– tracheal tube** if trained to do so
 - ▶ Apply **waveform capnography** monitoring to the airway
- ➐ **Check if drug treatment is needed**
 - ▶ Give **adrenaline** as soon as IV/IO access is available, then repeat every 3-5 minutes
- ➑ **Check for and treat reversible causes**
- ➒ **After 2 minutes → go to step ➍**

DRUG DOSES and Treatments

Adrenaline	10 micrograms kg⁻¹ (0.1 mg kg⁻¹ IV / IO)
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Critical CHANGES

- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If K⁺ > 7 mmol L⁻¹ ➔ **SEVERE HYPERKALAEMIA 3-5**

During RESUSCITATION

- 15 compressions to 2 rescue breaths, 100-120 min⁻¹, compress third depth of chest
- Continuous compressions once airway secured
- Aim for ETCO₂ of 2.0 kPa with CPR
- Check for reversible causes ➔ **ASSESSMENT OF REVERSIBLE CAUSES DURING CARDIAC ARREST 1-4**

Reversible CAUSES

Hypoxia	Tamponade – cardiac*
Hypovolaemia	Toxins
Hypo/hyperkalaemia & metabolic	Thrombus – coronary or pulmonary*
Hypothermia	Tension pneumothorax*
*Point of Care Ultrasound to assist in diagnosis (POCUS)	

POST-RESUSCITATION CARE

- Check ABCDE, blood glucose, ABG, U and E, FBC and, CXR
- Full set of clinical observations
- Aim for SpO₂ 94-98%, normal PaCO₂ – 4.5-6.0 kPa
- Temperature control
- Treat precipitating cause
- Consider transfer of patient to a critical care setting

1-4 | Reversible causes during cardiac arrest

Triggers of cardiac arrest for which specific treatments exist and must be considered during any cardiac arrest

START

- ① **Check for hypoxaemia ($\text{PaO}_2 < 10\text{-}13 \text{ kPa}$)**
 - ▶ Give 100% oxygen using BMV and check device correctly connected
 - ▶ Insert supraglottic airway –or– tracheal tube if trained to do so
 - ▶ Maintain normal PaCO_2 – 4.5–6 kPa
 - ▶ Check chest movement and air entry
- ② **Check for hypovolaemia**
 - ▶ Check for haemorrhage, sepsis, anaphylaxis, occult bleeding, or fluid loss
- ③ **Check for hypo/hyperkalaemia and electrolyte abnormalities**
 - ▶ Check potassium, calcium, and glucose on ABG
 - ▶ Check serum magnesium (arrhythmias)
- ④ **Check for hypothermia**
 - ▶ Check using low reading thermometer if necessary
- ⑤ **Check for thrombosis (pulmonary or coronary)**
 - ▶ Check past medical history/medications/clotting screen
 - ▶ Consider point-of-care ultrasound
- ⑥ **Check for tamponade (cardiac)**
 - ▶ Consider after trauma, some viral illnesses, cardiac interventions
 - ▶ Consider point-of-care ultrasound
- ⑦ **Check for tension pneumothorax**
 - ▶ Check bilateral air entry, chest movement, and airway pressure
 - ▶ Check for tracheal deviation
 - ▶ Consider point-of-care ultrasound
- ⑧ **Check for toxins**
 - ▶ Check drug chart and clinical notes
 - ▶ Seek advice from pharmacy or poisons centre for uncommon poisoning

DRUG DOSES and Treatments

CARDIAC ARREST/Post-resuscitation treatment

Potassium chloride	0.5 mmol kg⁻¹ (best given in HDU/ITU)
Magnesium sulfate 10%	0.25–0.5 mL kg⁻¹ over 10–15 mins (max 2 g)
Glucose 10%	2 mL kg⁻¹ IV/IO bolus , recheck 5–10 mins
Ketamine	1–2 mg kg⁻¹ IV/IO
Lorazepam	0.1 mg kg⁻¹ repeat 5–10 mins (max 4 mg)
Naloxone IV/IO/IM	100 mcg kg⁻¹ < 5 yrs and 2 mg > 5yrs

Critical CHANGES

- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If $\text{K}^+ > 7 \text{ mmol L}^{-1}$ ➔ **SEVERE HYPERKALAEMIA 3-5**
- If severe bleeding ➔ **MASSIVE HAEMORRHAGE 3-6**
- If sepsis ➔ **SEPSIS MANAGEMENT 3-8**

During RESUSCITATION

- Give high-flow oxygen via bag-mask ventilation (BMV), SGA or tracheal tube
- Give IV/IO fluids e.g. balanced crystalloid or blood as required
- If serum potassium $< 2.5\text{--}3.5 \text{ mmol L}^{-1}$ ➔ give potassium chloride
- If serum magnesium $< 0.5 \text{ mmol L}^{-1}$ ➔ give magnesium IV **25–50 mg kg⁻¹ max**
- If hypothermia ➔ start active warming and warmed fluids if $< 35^\circ\text{C}$
- If hyperthermic ➔ management guided by specific cause
- Hyper/hypoglycemia ➔ **treat if $< 3.9 \text{ mmols}$ symptomatic or $< 3.0 \text{ mmols}$ if asymptomatic repeat every 5–10 mins**
- If PE ➔ consider fibrinolytic drugs (e.g. alteplase)
- If toxins ➔ check for relevant reversal agents
- Pneumothorax ➔ needle thoracocentesis followed by chest drain insertion

Other reference information

- Use waveform capnography if an advanced airway inserted
- Consider extracorporeal CPR (eCPR) if available
- Consider dialysis if available



2-1 | Bradycardia

Heart rates less than 60 min⁻¹ in children and < 80 min⁻¹ in infants is poorly tolerated: **If there are no signs of life commence CPR Immediately** (consider vagal stimulation)

START

- ① **Check responsiveness:**
 - ▶ AVPU and circulation simultaneously
 - ▶ If no signs of life, call for help, commence **CPR immediately** and BMV support
 - If signs of life:
- ② **Check Airway**
 - ▶ Consider suction to clear secretions
 - ▶ **Apply oxygen at 10-15 L min⁻¹** via reservoir mask
 - ▶ **Titrate to SpO₂ 94-98%** when saturation monitoring is available
- ③ **Check breathing**
 - ▶ Consider bag-mask ventilation to support effective ventilation
- ④ **Check circulation**
 - ▶ **Assess peripheral and central pulses**
 - ▶ **Attach 3 lead ECG** for rhythm
 - ▶ **Establish IV/IO access** if not in situ
 - ▶ **Administer: adrenaline** 10 micrograms kg⁻¹
 - ▶ **Reassess HR** for effectiveness
- ⑤ **Check for causes:**
 - ▶ **Check for Hypoxia**
 - ▶ **Check events/interventions prior to event** (suctioning, vomiting, sepsis, etc.)
 - ▶ **Check serum electrolytes and drug history**
 - ▶ **Check records for cardiac history**
 - ▶ If Check for complete heart block (12 lead ECG) see **Pacing**
- ⑥ **If pacing required**
 - ▶ **Call for expert help**
 - ▶ **Call anaesthetic/ICU for support with sedation**
 - ▶ Ensure both **defibrillator pads and the 3-lead ECG** are applied

DRUG DOSES and Treatments

Atropine*	Infant to 11 years – 20 mcg kg ⁻¹ IV/IO 12- 17 yrs – 300-600 mcg IV/IO
Adrenaline	10 mcg kg ⁻¹ (1:10,000) IV/IO
Isoprenaline	5 mcg min ⁻¹ IV infusion
Dopamine	2.5-10 mcg kg ⁻¹ min ⁻¹ IV infusion
Glucagon	2-10 mg IV in glucose 5% –then– 50 mcg kg ⁻¹ h ⁻¹ IV infusion

*If increased vagal tone is suspected as the cause

Critical CHANGES

- | | |
|---|--|
| <ul style="list-style-type: none"> • If PEA or asystole • If VF or pulseless VT | <ul style="list-style-type: none"> ➔ NON-SHOCKABLE CARDIAC ARREST 1-3 ➔ SHOCKABLE CARDIAC ARREST 1-2 |
|---|--|

Relevant LIFE-TREATENING FEATURUES

- | | |
|--|--|
| <ul style="list-style-type: none"> • Hypoxia • Shock | <ul style="list-style-type: none"> • Cardiac failure • Syncope |
|--|--|

Factors increasing RISK OF ASYSTOLE

- Hypoxia not responding to bag-mask ventilation support
- Complete heart block with broad QRS complexes

Pacing

- Antero-posterior pad position preferred due to smaller chest
- Set pacer rate to 100 min⁻¹
- Start pacing
- Increase pacer output until capture is achieved (often 45-70 mA)
- After electrical and mechanical capture, set pacer output to 10mA above the capture point
- If no pacing capture is achieved, change pad position to lateral position
- Use default demand mode unless guided by an expert
- It is safe for staff to touch patients receiving transcutaneous pacing and deliver oxygen
- Check pulse and BP

2-2 | Supraventricular Tachycardia (SVT)

Tachyarrhythmia causing haemodynamic compromise. Synchronised cardioversion is the mainstay of treatment if signs of shock are present

START

- ➊ **Call for expert help and request resuscitation trolley**
 - ▶ Start ABCDE assessment to confirm **life-threatening features**
 - ▶ Attach **ECG leads** and **defibrillator pads**
 - ▶ Confirm diagnosis of SVT
 - ▶ Check **history** and **drug chart** for causes of tachycardia
 - ▶ Check **serum electrolytes** and take sample for **blood gas** analysis
- ➋ **If conscious but BP Stable** (Above 5th centile systolic BP)
 - ▶ Consider **vagal manoeuvres**
 - ▶ Consider IV **adenosine**
- ➌ **If conscious but BP Unstable** (Below 5th centile Systolic BP)
 - ▶ Electrical cardioversion is required; call for anaesthetic help
 - ▶ Do not delay cardioversion for IV access
 - ▶ Call **anaesthetics/ICU** for assistance
 - ▶ **Give sedation** e.g. IM/Intranasal/IV ketamine
 - ▶ Select **Synchronised** option on defibrillator
 - ▶ **1st shock delivered at 1 J kg⁻¹**
 - ▶ **2nd shock at 2 J kg⁻¹**
 - ▶ **Check ECG following, and confirm pulses present**
 - ▶ **Recommence oxygenation** between shocks
- ➍ **Give up to three synchronised shocks**
 - ▶ Check ECG, heart rate, and blood pressure after each
 - ▶ Give oxygen between shocks
 - ▶ If no response after three shocks → seek expert cardiology help –*then*– give **amiodarone**
- ➎ **If no pulse/signs of life start CPR**

DRUG DOSES and Treatments

Adenosine

- **Neonates** – 150 mcg kg⁻¹, increase in steps 50-100mcg kg⁻¹, (max 300 mcg)
- **Infant** – 1-11 months 150 mcg kg⁻¹ increase in steps 50-100 mcg kg⁻¹ (max 500 mcg)
- **Child** – 1-11 yrs 100 mcg kg⁻¹ increase in steps 50-100 mcg kg⁻¹, (max 12 mg)
- **Young adult** – 12-17 yrs 3 mg (after 1-2 mins) 6 mg (after 1-2 mins) 12 mg

Amiodarone

- 5 mg kg⁻¹ by slow IV infusion (> 20 min) before 3rd cardioversion in discussion with paediatric cardiology/expert

Critical CHANGES

- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**

Vagal Manoeuvres

- Seek expert help
- Consider ice cold flannel placed briefly over face (Infants)
- Blowing through a straw or 20 mL syringe to expel plunger (cooperative children)

Relevant LIFE-TREATENING FEATRES

- | | |
|-----------|------------|
| • Hypoxia | • Ischemia |
| • Shock | • Syncope |

SVT Cardioversion Energy

- 1st shock at 1 J kg⁻¹
- 2nd shock at 2 J kg⁻¹

SYNCHRONISED Shock

- Seek expert help
- Cardioversion requires **synchronised shock** with **appropriate sedation**
- When **'Sync'** is on, the defibrillator will indicate a marker on the QRS complexes and display a 'sync' message
- When delivering the shock, keep the shock button pressed until the shock is delivered.
- Check that synchronisation is still active after every shock

2-3 | Broad Complex Tachycardia with a Pulse

Broad complex VT usually found in children with underlying cardiac history (but is uncommon); it may also be caused by SVT with aberrant conduction. Broad complex tachycardias may be seen after ingestion of certain drugs

START

- 1 **Call for Expert help**
 - ▶ Resuscitation trolley to bedside, attach **defibrillator pads**
- 2 **Check Airway**
- 3 **Check breathing**
 - ▶ Give **Oxygen 10-15 L** via reservoir mask
- 4 **Assess circulation**
 - ▶ Assess HR, BP and central and peripheral pulse quality
 - ▶ Confirm diagnosis of Broad Complex Tachycardia on ECG
 - ▶ If not already done so **call Expert help**
- 5
 - ▶ **If conscious but BP Unstable** (Below 5th centile Systolic BP)
 - ▶ **Electrical cardioversion required; call for anaesthetic help**
 - ▶ **Do not delay cardioversion for IV access**
 - ▶ **Give sedation** e.g. IM/Intranasal or IV **ketamine**
 - ▶ **Select Synchronised** option on defibrillator
 - ▶ **1st shock delivered at 1 J kg⁻¹**
 - ▶ **Check ECG, and confirm pulse remains present**
 - ▶ **2nd shock at 2 J kg⁻¹**
 - ▶ **Check ECG, and confirm pulse remains present**
 - ▶ **Recommence oxygenation** between shocks
 - ▶ If no response after three shocks, **Seek Expert Cardiology help**
 - ▶ **If no pulse/signs of life start CPR** ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- 6 **Consider**
 - ▶ **Check history** and **drug chart** for causes
 - ▶ **Check** bloods and blood gas for serum electrolytes and acid base
 - ▶ Consider **sodium bicarbonate** in face of metabolic acidosis and suspected toxicity
 - ▶ **Consider hypokalemia 2.5-3.3 mmol L⁻¹**

DRUG DOSES and Treatments

KCl⁺ infusion = 0.5 mmol kg⁻¹ h⁻¹ Via central line until arrhythmia resolved/K⁺ >3.5mmol L⁻¹
 (Total dose of 2-3 mmols kg⁻¹ KCl may be required until the patient is clinically stable)

Sodium bicarbonate 8.4%
 1 mmol/kg IV over 20 minutes (if toxicity suspected)

Critical CHANGES

- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**

Relevant LIFE-TREATENING FEATRUERS

- Shortness of breath
- Chest pain
- Palpitations
- Heart Failure

Synchronised Cardioversion Energy for Broad VT with a pulse

- 1st shock at 1 J kg⁻¹
- 2nd shock at 2 J kg⁻¹

SYNCHRONISED Shock

- Cardioversion requires **synchronised shock** with appropriate sedation.
- When **'Sync'** is on, the defibrillator will indicate a marker on the QRS complexes and display a 'sync' message
- When delivering the shock, keep the shock button pressed until the shock is delivered.
- Check that synchronisation is still active after every shock

Post Successful cardioversion.

- Maintain Cardiac monitoring and clinical observations
 - 12 lead ECG
 - Chest X Ray
 - Repeat Serum electrolyte .
- Consider amiodarone infusion after 3rd shock (expert guidance)

3-1 | Altered conscious level

A child's conscious level may be altered by illness, injury or intoxication

START

- ➊ **Call for help and consider requesting resuscitation trolley**
ABCDE assessment
- ➋ **Check airway**
 - ▶ **Obstructed**, or unprotected → call anaesthetics/critical call urgently
 - ▶ **Apply oxygen at 10-15 L min⁻¹** via reservoir mask
 - ▶ **Titrate to SpO₂ 94-98%** when saturation monitoring is available
- ➌ **Check breathing**
 - ▶ Optimise ventilation with bag-mask ventilation if required
- ➍ **Assess circulation**
 - ▶ If hypotension → give 10ml/kg balanced crystalloid
- ➎ **Assess disability**
 - ▶ Check AVPU and GCS
 - ▶ Check pupils
 - ▶ Check blood glucose
 - ▶ Check tone/seizure activity
- ➏ **Assess exposure**
 - ▶ Look for rashes, e.g. meningococcaemia
 - ▶ **identify and treat** common causes
 - ▶ **Consider CT head**
- ➐ **Check for common causes**
- ➑ **Transfer patient to critical care setting**

DRUG DOSES and Treatments

Oxygen **15 L min⁻¹** via **reservoir mask**
Target SpO₂ of 94-98%

Glucose - 2ml/kg 10% dextrose then recheck (every 5-10 mins)

Fluid bolus – 10ml/kg balance crystalloid

Adrenaline infusion – **Adrenaline 0.05-0.3 mcg/kg/min**
Via central line (use more dilute infusion if peripheral)

Critical CHANGES

- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**

During RESUSCITATION

Consideration for intubation and assisted ventilation

- Inadequate oxygenation by bag-mask ventilation
- Respiratory arrest
- GCS < 8, Glasgow motor score < 4 or 'P' or 'U' on AVPU
- Prolonged or controlled ventilation required e.g. CO₂ control +/- neuroprotection
- Respiratory failure (hypoventilation +/- hypoxia despite 100% oxygen)
- Trauma – flail chest, severe facial injuries or severe head injury
- Refractory seizures
- Inhalation injury with burns

If convulsive status epilepticus identified follow local/national guidelines

Common CAUSES

- Raised ICP – confusion, bradycardia, hypertension, abnormal pupils, abnormal posturing
- Drugs, toxin and medications
- Metabolic causes – check ammonia (important particularly for infants)
- Hypoglycaemia
- Hyperglycaemia – consider DKA, check ketones
- Head injury
- Hypotension – sepsis, anaphylaxis, cardiac
- Hypoxia – bronchiolitis, pneumonia, sepsis

3-2a | Anaphylaxis

Anaphylaxis is a life-threatening hypersensitivity reaction featuring rapidly developing hypotension and tachycardia, and potentially life-threatening airway obstruction or bronchospasm usually associated with skin/mucosal changes (e.g. itchy rash)

START

- ➊ **Call for help and consider requesting resuscitation trolley**
 - ▶ Identify **team leader**, **allocate roles**, and **note the time**
- ➋ **Check ABCDE**
 - ▶ **Remove trigger if possible** (e.g. stop any infusion)
 - ▶ If **respiratory distress** → sit the patient **upright**, **BUT**
 - ▶ If **hypotension** → lie the patient **flat** and **elevate the legs**
 - ▶ Check airway patency and give **oxygen** 10-15 L min⁻¹ via reservoir mask
 - ▶ If airway involvement → call **anaesthetics/PICU**
- ➌ **Treat anaphylaxis**
 - ▶ Give **intramuscular (IM) adrenaline** and repeat at **5 minute intervals** if no improvement
 - ▶ Give a **rapid bolus of IV balanced crystalloid** 10 mL kg⁻¹
- ➍ **Check the patient's response**
 - ▶ If no improvement after two doses of IM adrenaline state '**refractory anaphylaxis**' then go to **REFRACTORY ANAPHYLAXIS 3-2b**
- ➎ **Take mast-cell tryptase sample**
 - ▶ **5-10 mL clotted blood** drawn as soon as feasible following initial resuscitation
- ➏ **Consider transfer of patient to PICU setting**
 - ▶ Start **post-event** actions

DRUG DOSES and Treatments

Adrenaline bolus* **Intramuscular (IM) Adrenaline**

Use adrenaline at 1 mg mL (1:1000) concentration

Adult > 12 years: 500 micrograms IM (0.5 mL)

6-12 years: 300 micrograms IM (0.3 mL)

6 months – 6 years 150 micrograms IM (0.15 mL)

< 6 months: 100-150 micrograms IM (0.15-0.1 mL)

IV Fluid **Use balanced crystalloid** or 0.9% sodium chloride
Children 10 mL kg⁻¹
Adult 500-1000 mL

Oxygen **15 L min⁻¹ via reservoir mask then titrate to**
SpO₂ 94-98%

** IM is preferred; IV/IO adrenaline **ONLY** to be given by experienced specialists*

Critical CHANGES

- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**

During RESUSCITATION

- Remove the potential causative agent where possible
- Give rapid bolus of IV fluids

Reversible CAUSES

- Antibiotics
- Contrast media
- Anaesthetic drugs; neuromuscular blocking drugs
- Chlorhexidine
- Nuts, insect stings, foodstuffs

POST-EVENT actions

- Take second tryptase sample at 1-2 hours, and third after 24 hours
- Consider cetirizine for cutaneous symptoms
- Make referral to a specialist allergy or immunology centre to identify the causative agent (see www.bsaci.org for details)
- Report anaphylactic drug reactions to the MHRA using the yellow card scheme (www.mhra.gov.uk)
- Inform the patient, family/carers and their GP

3-2b | Refractory Anaphylaxis

Refractory anaphylaxis exists where the patient shows no improvement in cardiovascular or respiratory symptoms after two appropriate doses of IM Adrenaline

START

- ➊ **Call for anaesthetics/critical care if not already present**
 - ▶ Insert peripheral IV or IO access
 - ▶ Give rapid IV bolus e.g. **balanced crystalloid** or **0.9% sodium chloride**
 - ▶ Give oxygen **10-15 L min⁻¹ oxygen** –then– titrate to SpO₂ 94-98%
- ➋ **Start continuous monitoring if not already started**
 - ▶ 3-lead ECG
 - ▶ Pulse oximetry
 - ▶ Blood pressure on automatic cycle (at least every 5 minutes)
- ➌ **Start adrenaline infusion**
 - ▶ Repeat **IM adrenaline** at **5 minute intervals** until infusion started
- ➍ **Check the patient's response**
 - ▶ If ongoing shock → give **rapid bolus(es) of IV balanced crystalloid** –and– give **steroid treatment**
 - ▶ If severe or persistent wheeze → give nebulised **salbutamol** –and– give **steroid treatment**
- ➎ **Take mast-cell tryptase sample**
 - ▶ **5-10 mL clotted blood** drawn as soon as feasible following initial resuscitation
- ➏ **Transfer of patient to critical care setting**
 - ▶ Start **post-event** actions

DRUG DOSES and Treatments

Adrenaline bolus*	As per anaphylaxis guideline ➡ 3-2a
Adrenaline infusion†	Check local protocol –or– 1 mg in 100 mL 0.9% sodium chloride via peripheral IV ; start at 0.5-1.0 mL kg⁻¹ hr⁻¹
Oxygen	15 L min⁻¹ via reservoir mask –then– titrate to SpO ₂ 94-98%
Crystalloid bolus	10 mL kg⁻¹ balanced crystalloid per bolus, titrated to response Adult 500 – 1000 mL per bolus
Steroid treatment	prednisolone PO/NG if possible – or – hydrocortisone IV if PO route unavailable

* IM is preferred; IV/IO adrenaline **ONLY** to be given by experienced specialists

† Only for refractory anaphylaxis

Critical CHANGES

- If VF or pulseless VT ➡ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➡ **NON-SHOCKABLE CARDIAC ARREST 1-3**

POST-EVENT actions

- Take second tryptase sample at 1-2 hours, and third after 24 hours
- Consider cetirizine for cutaneous symptoms
- Make referral to a specialist allergy or immunology centre to identify the causative agent (see www.bsaci.org for details)
- Report anaphylactic drug reactions to the MHRA using the yellow card scheme (www.mhra.gov.uk)
- Inform the patient and their GP

3-3 | Asthma

A potentially life-threatening emergency characterised by respiratory distress, wheeze, and hypoxaemia

START

- ➊ **Call for help and consider requesting resuscitation trolley**
 - ▶ Identify **team leader**, **allocate roles**, and **note the time**
- ➋ **Check ABCDE**
 - ▶ Check level of consciousness and ability to speak
 - ▶ Check for symmetrical breath sounds and chest movements
 - ▶ Check respiratory rate, heart rate, SpO₂, peak expiratory flow rate
 - ▶ **If acute severe or life-threatening → Check ABG**
- ➌ **Give oxygen**
 - ▶ Apply oxygen at 10-15 L min⁻¹ via reservoir mask initially
 - ▶ Titrate to SpO₂ 94-98% when monitoring available
- ➍ **Check for life-threatening features**
 - ▶ **Call anaesthetics/critical care urgently**
- ➎ **Start nebulised bronchodilators**
 - ▶ Give nebulised **salbutamol** (repeat immediately if severe or **life-threatening**)
 - ▶ Give **ipratropium** (repeat every 20 minutes for 2 hours if severe or **life-threatening**)
- ➏ **Give steroid therapy**
- ➐ **Start therapy if limited response to nebulisers**
 - ▶ Apply **cardiac monitoring**
 - ▶ Start **IV magnesium**
 - ▶ Check **electrolytes**
- ➑ **If poor response to IV magnesium → call anaesthetics/critical care**
 - ▶ Call for senior medical advice on starting IV salbutamol or IV aminophylline.
- ➒ **Transfer of patient to PICU setting**
 - ▶ If **tracheal intubation** required → consider **ketamine**
 - ▶ Airway pressures likely to be high initially

DRUG DOSES and Treatments

Salbutamol nebulised via oxygen	Infant 1 month-4 yrs 2.5 mg 5 yrs-11yrs 2.5-5 mg 12 yrs-17 yrs 5 mg
Ipratropium bromide nebulised via oxygen	Infant 1 month-5 yrs 125-500 mcg 6 yrs-11 yrs 250 mcg 12 yrs – 17yrs 500 mcg
Steroid therapy	Hydrocortisone 4 mg kg ⁻¹ IV bolus –or– 2-5 years – prednisolone 20 mg PO > 5 years – prednisolone 40 mg PO
Magnesium sulfate 10%	25–50 mg kg ⁻¹ (max 2 g)
Aminophylline [specialist use]	5 mg kg ⁻¹ IV over 20 min* then 0.5-0.7 mg kg ⁻¹ hr ⁻¹ IV infusion
<i>*omit loading dose if taking PO theophylline and monitor levels regularly</i>	

Critical CHANGES

- If VF or pulseless ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If infection found ➔ **SEPSIS 3-8**

During RESUSCITATION

- Give maximal oxygen therapy; Intubation must be guided by Anaesthetic expert
- Take care to exclude tension pneumothorax and gas trapping
- Extra-corporeal life support should be considered **in refractory Asthma**

Features of SEVERE Asthma

- Agitated, distressed
- PEF 33-50% predicted
- O₂ saturations < 92% in air
- Heart rate > 140 min⁻¹ (2-5 years)
- RR > 40 min⁻¹ (2-5 years)
- Heart rate > 125 min⁻¹ (> 5 years),
- RR > 30 min⁻¹ (> 5 years),

Features of LIFE-THREATENING/NEAR FATAL asthma

- PEF < 33% predicted
- SpO₂ < 92% or PaO₂ < 8 kPa
- Maximal accessory muscle use (poor effort = pre-terminal)
- Arrhythmia or hypotension
- Confused, drowsy, Silent chest, cyanosis

3-4 | Choking

Foreign body airway obstruction (FBAO), with an ineffective cough in a patient who is conscious

START

- ➊ **Call for help and consider requesting resuscitation trolley**
 - ▶ Check for **effective cough** (breathing before coughing, crying, talking)
 - ▶ If **coughing effectively**, encourage coughing and monitor the patient
- ➋ **If the airway is obstructed**
 - ▶ **Position infant (< 1 year) head down, prone position**
 - ▶ **Position child > 1 year (consider infant position if small)**, allow to stand -or- bend them at the waist to deliver back blows and to perform abdominal thrusts.
 - ▶ **Infant and child (< 1 year)**: Give up to **5 back blows** (check airway quickly after each attempt)
 - ▶ **Children (> 1 year)**: Give up to **5 back blows** (check airway quickly after each attempt)
- ➌ **If the airway remains obstructed:**
 - ▶ **Infant**: alternate between **5 back blows** and **5 chest thrusts**
 - ▶ **child**: alternate between **5 back blows** and **5 abdominal thrusts**
- ➍ **Stop** if the airway clears
- ➎ **If the patient becomes unconscious with foreign body airway obstruction** ▶ **Ensure expert airway help has been called**
 - ▶ **Airway opening**: If foreign body airway obstruction can be seen and is easily accessible, attempt removal
 - ➡ **Cardiac arrest management prior to team arrival 1-1**

DRUG DOSES and Treatments

Oxygen **15 L min⁻¹ high-flow** via **bag-mask ventilation** during cardiac arrest

CARDIAC ARREST treatment

Removal of foreign body May require **laryngoscopy** and **Magill forceps***

** specific airway training required*

Critical CHANGES

- If VF or pulseless ➡ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➡ **NON-SHOCKABLE CARDIAC ARREST 1-3**

During RESUSCITATION

- With appropriate skills, undertake laryngoscopy and attempt to remove any foreign body with Magill forceps
- Consider early tracheal intubation
- If cardiac arrest occurs due to tracheo-bronchial foreign body, intubation will still provide the best opportunity for oxygenation; push tracheal material into one bronchus to allow one-lung ventilation if necessary
- Emergency surgical airway may be required

BACK BLOWS

- Deliver with the heel of one hand between the shoulder blades
- Check between each blow to see if the obstruction has been relieved

CHEST THRUSTS for infants

- Turn the infant into a head-downwards supine, support the infant down your arm, which is placed down (or across) your thigh.
- Identify the landmark for chest compression
- Deliver up to 5 chest thrusts (2 thumb technique). These are similar to chest compressions but sharper in nature and delivered at a slower rate
- Check between each thrust to see if the obstruction has been relieved

ABDOMINAL THRUSTS for children over 1 year

- Stand or kneel behind the child, place your arms under the child's arms and encircle their torso
- Place a fist under the xiphisternum
- Pull sharply inwards and upwards
- Check between each abdominal thrust to see if the obstruction has been relieved



3-5 | Severe Hyperkalaemia

Serum potassium greater than 6.5-7 mmol L⁻¹, with or without ECG changes. ECG changes may include: flattened/absent P-waves, tall T-waves, broad QRS complexes, ST-segment changes

START

- 1 Call for help and consider requesting resuscitation trolley
 - ▶ Identify team leader, allocate roles, and note the time
- 2 Check ABCDE
- 3 Apply continuous cardiac monitoring and consider 12-lead ECG
- 4 Give **calcium** if ECG changes
 - ▶ Can be repeated after **5 minutes** if ECG changes persist
- 5 Give nebulised **salbutamol** (repeat up to five times)
- 6 Start IV **insulin/dextrose** infusion
 - ▶ Check serum potassium and blood glucose after treatment
- 7 Start **bicarbonate** IV if metabolic acidosis
- 8 If hyperkalaemia persists → consider need for emergency dialysis
 - ▶ Call ICU or renal team
- 9 Check for and remove any suspected causative agent(s)
 - ▶ Check drug chart
 - ▶ Check infusions connected to patient
- 10 Check for medical history of:
 - ▶ Renal failure
 - ▶ Acidosis
 - ▶ Adrenal insufficiency → **ADRENAL CRISIS 3-9**
 - ▶ K⁺ sparing diuretics/current drug regime
 - ▶ Cell lysis e.g. tumour/trauma/rhabdomyolysis
 - ▶ Addison disease

DRUG DOSES and Treatments

Insulin/Dextrose infusion	short-acting insulin 0.1 units kg⁻¹ (max 10 units) IV in 10 mL kg ⁻¹ 10% dextrose
Salbutamol Nebulised	< 10 kg 2.5 mg every 1-2 h > 10 kg 5 mg every 1-2 h
Salbutamol IV mcg kg ⁻¹	5 mcg kg ⁻¹ bolus IV over 5 mins repeat in 15 min (max 15 mcg kg ⁻¹)
Furosemide	1 mg kg ⁻¹ IV (max 20 mg)

Metabolic Acidosis treatment (avoid giving in IV line with calcium)

Sodium bicarbonate (8.4% solution) 1-2 mmol kg⁻¹ IV bolus

Critical CHANGES

- | | |
|----------------------|---|
| • If VF or pulseless | → SHOCKABLE CARDIAC ARREST 1-2 |
| • If PEA or asystole | → NON-SHOCKABLE CARDIAC ARREST 1-3 |

During RESUSCITATION

In cardiac arrest:

- Confirm hyperkalaemia using blood gas analyser if available
- Give calcium gluconate OR calcium chloride
- Give insulin/dextrose by rapid bolus
- Give sodium bicarbonate by rapid bolus
- Consider dialysis if hyperkalaemia resistant to medical therapy

3-6 | Massive Haemorrhage

Major haemorrhage in children is often concealed. Catastrophic haemorrhage and penetrating injuries are less common compared to adults. Internal bleeding is more common. Approximately 40% of circulating volume may be lost before Hypotension occurs. The circulating volume of a child is $\sim 70 \text{ mL kg}^{-1}$

START

- ➊ **Call for help and consider requesting resuscitation trolley**
 - ▶ Declare 'major haemorrhage'
 - ▶ Call **anaesthetic** and/or **surgical/radiological support** if appropriate
- ➋ **Insert IV cannula if not already present**
 - ▶ Insert **IO access** if IV not feasible
 - ▶ **Take blood for FBC, clotting, fibrinogen, and cross-matching**
 - ▶ Take **POCT-coagulation monitoring** (e.g. TEG or ROTEM)
- ➌ **Check for obvious bleeding points**
 - ▶ **Elevate site, apply pressure, and/or apply tourniquet** if possible
 - ▶ Surgical or IR control if incompressible haemorrhage
 - ▶ **Apply topical haemostatic agent** if available
 - ▶ Use imaging to locate concealed sources
- ➍ **Give IV fluid challenge(s) or blood products**
 - ▶ Start fluid warmer
 - ▶ Give blood products as early as possible
 - ▶ Apply a pressure bag to fluids or use a large syringe to push fluids or rapid-infusion device
- ➎ **Give medical management**
 - ▶ Give **tranexamic acid**
 - ▶ Check for **hypocalcaemia**
 - ▶ Reversal of anticoagulant drugs (check child's medications)
- ➏ **Insert urinary catheter and check urine output hourly**
- ➐ **Reassess patient regularly**
 - ▶ **Check ABCDE**
 - ▶ Check, **ABC, clotting, fibrinogen, glucose potassium and lactate**
 - ▶ Check for **fluid overload**

DRUG DOSES and Treatments

Tranexamic acid	15 mg kg⁻¹ over 10 min – then 2 mg kg h⁻¹ over 8 h
Calcium replacement	0.2 mL kg⁻¹ (max 10 mL) 10% calcium chloride OR 0.5 mL kg⁻¹ (max 20 mL) 10% calcium gluconate

Critical CHANGES

- If infection found ➔ **SEPSIS 3-8**
- If $\text{K}^+ > 7 \text{ mmol L}^{-1}$ ➔ **SEVERE HYPERKALAEMIA 3-5**

During RESUSCITATION

- Control of ongoing bleeding is essential
- Urgent surgical input may be necessary
- Haematology assistance may be helpful where reversal of anticoagulation needed (if child is on anticoagulants)

FLUID MANAGEMENT

- Multiple large-bore (14-16 G) cannulas are most appropriate
- Peripheral cannulas generally preferable to central venous lines for fluid challenges
- Use small volume boluses to maintain central circulation until blood products arrive
- Aim to restore normal circulating volume after control of bleeding

Considerations for BLOOD MANAGEMENT

- Early use of blood products is essential in major haemorrhage
- Use a ratio of 1 unit red cells to 1 unit FFP
- Platelets are likely to be needed
- Cryoprecipitate may be needed if fibrinogen is low or bleeding prolonged FFP (target 1.5 g L^{-1})
- Early involvement of the haematologist on call is helpful

3-8 | Sepsis

Sepsis is diagnosed if there is evidence of infection as a cause of the acute illness (suspected or proven) plus at least **TWO** of the following:
 Core temperature < 36°C or > 38.5°C (for immunocompromised patients > 38°C); white cell elevated or depressed for age; inappropriate tachycardia; altered mental state; reduced peripheral perfusion. The following steps will guide you through the sepsis 6 within the first 60 minutes of treatment

START

- ① **First 5-10 min – Recognition**
 Call for help commence **Sepsis Six bundle** and timer
 ▶ Check ABCDE
- ② **Give oxygen**
 ▶ Titrate to SpO₂ 94-98% when monitoring available
- ③ **Insert IV/IO access if not already present: Take blood for:**
 ▶ **Blood gas** (including **lactate**)
 ▶ **Blood culture**
 ▶ **FBC, U&Es, CRP, clotting, blood glucose**
10-15 mins – Initial Resuscitation
- ④ **Give broad-spectrum antibiotics immediately (local policy)**
- ⑤ **Start resuscitation**
 ▶ Give 10 mL kg⁻¹ **balanced crystalloid** (over 5-10 mins), repeat as clinically indicated
 ▶ If 40–60 mL kg⁻¹ is indicated, **involve critical care support early**
 ▶ If signs of cardiac failure present consider **inotropes***
 ▶ Correct hypoglycaemia and hypokalaemia if present
- ⑥ **Check vital signs at least every 10-15 minutes**
15–60 mins – If Not responding to fluid bolus
- ⑦ **Check Refractory shock: Start IV/IO inotropic infusion, involve critical care**

DRUG DOSES and Treatments

Oxygen	15 L min⁻¹ via reservoir mask Target SpO ₂ of 94-98% (if risk of hypercapnic respiratory failure → target 88-92%).
Antibiotics	As per local guidelines Broad spectrum empirical antibiotics for sepsis of unknown origin unless the source is known.
Initial fluid challenge	10 mL kg⁻¹ IV/IO crystalloid bolus every 5-10 mins up to 40-60 mL kg⁻¹ or until perfusion improves
Inotropes	Adrenaline 0.05-0.3 mcg kg⁻¹ min⁻¹ or Noradrenaline 0.05 mcg kg⁻¹ min⁻¹ via central line (use more dilute infusion if peripheral)

SEPSIS Six

- | | |
|------------------|----------------------|
| • Blood cultures | • Antibiotics |
| • Lactate | • Oxygen (if needed) |
| • Urine output | • Fluids |

Critical CHANGES

- | | |
|--|---|
| • If VF or pulseless | ➔ SHOCKABLE CARDIAC ARREST 1-2 |
| • If PEA or asystole | ➔ NON-SHOCKABLE CARDIAC ARREST 1-3 |
| • If K ⁺ > 6.5 mmol L ⁻¹ | ➔ SEVERE HYPERKALAEMIA 3-5 |

During RESUSCITATION

- **Red Flags (any 1 present)**
 - Lactate > 2 mmol L (prognostic if measured serially)
 - Extreme tachycardia
 - SpO₂ ≤ 91%: grunting/cyanosis/apnoea
 - AVPU = P or U
 - Persistent hypotension 3 x consecutive measurements in 1 hour
 - Non-blanching rash/mottled skin
- Consider adrenal suppression if the patient has been on steroids.
- Therapeutic endpoints: CRT < 2 s; UO > 1 mL kg⁻¹ h⁻¹, normal pulses, normal mental state.

3-9 | Adrenal Crisis

“Think Adrenal” – Treat if a patient presents acutely unwell and has a known diagnosis of adrenal insufficiency or the diagnosis is suspected from the history/examination.

START

- 1 Call for help
- 2 Check **ABCDE** see **clinical status** (capillary glucose is essential)
- 3 Insert IV/IO access if not already present
 - ▶ Check capillary glucose
 - ▶ Check venous bloods including gas glucose, electrolytes, lactate, Cortisol, U and Es, LFT'S, CRP, blood cultures, clotting
 - ▶ Check hyperkalaemia and hyponatraemia and inform critical care
- 4 Give IV/IM **hydrocortisone** (If any delay in obtaining IV access give IM)
- 5 Give 2 mL kg⁻¹ 10% dextrose IV if glucose < 3 mmol L⁻¹
- 6 Check for concurrent sepsis → **GUIDANCE 3-8** seek source and administer broad spectrum antibiotics
- 7 If circulation is compromised, give 10 mL kg⁻¹ of **0.9% sodium chloride**; reassess after each bolus
- 8 Correct severe Hyperkalaemia if present → **GUIDANCE 3-5**
Correct **severe hyponatraemia** if present
Consider Anaesthetic/PICU support early for transfer to critical care.
- 9 Start IV fluids **0.9% sodium chloride/5% dextrose** at a maintenance rate and continue **hydrocortisone** treatment
- 10 Re-check ABCDE
- 11 Call tertiary endocrine for advice

DRUG DOSES and Treatments

hydrocortisone (give IM if no IV access)

Age < 1 year	25 mg
Age 1-5 years	50 mg
Age > 6 years	100 mg

Ongoing hydrocortisone doses:

2 mg kg⁻¹ (max 100 mg) IV every 4-6 hours (or hydrocortisone infusion if very unwell).

Stable: **1 mg kg⁻¹ (max 50 mg) IV bolus every 6 hours**

Neonates: (< 28 days) **4 mg kg⁻¹ IV bolus dose every 4-6 hours.**
(once stable: IV bolus dose is **2 mg kg⁻¹ every 6 hours**).

Fluid bolus:

***10 mL kg⁻¹ IV/IO 0.9% sodium chloride solution every 5-10 mins up to 40-60 mL kg⁻¹ or until perfusion improves.**

Hypertonic saline:

for serum sodium < 125 mmol L⁻¹ and seizures – give **3 mL kg⁻¹ 3% sodium chloride over 20 min.**

Glucose **2 mL kg⁻¹ 10% dextrose IV if glucose < 3 mmol L⁻¹**

Critical CHANGES

- If K⁺ > 7 mmol L⁻¹ → **SEVERE HYPERKALAEMIA 3-5**

During RESUSCITATION

- Consider concomitant sepsis and treat
- If seizures with normal blood glucose, measure serum sodium and treat if Na⁺ < 125 mmol L⁻¹
- Can give IM hydrocortisone even if patient shocked
- 0.9% sodium chloride is initially preferable as often potassium is high

Clinical status

- **Presentation:** vomiting, anorexia, dehydration, abdominal pain, weakness, shock, tachycardia, hypotension, drowsiness, hypoglycaemia, hyponatraemia, hyperkalaemia
- Commonest iatrogenic steroid use (currently receiving supraphysiological doses of steroids (equivalent to > 10 mg^{m2} day⁻¹ hydrocortisone) or history of steroid treatment > 3 weeks)
- History of **hypopituitarism or congenital adrenal hyperplasia/Addison's disease** (weight loss, fatigue, hyperpigmentation, salt craving, other autoimmune conditions, family history)
- Acquired adrenal insufficiency (brain tumour, head injury)

3-1 | Broad Complex Tachycardia with a Pulse

Broad complex VT usually found in children with underlying cardiac history (but is uncommon); it may also be caused by SVT with aberrant conduction. Broad complex tachycardias may be seen after ingestion of certain drugs

START

- 1 **Call for Expert help**
 - ▶ Resuscitation trolley to bedside, attach **defibrillator pads**
- 2 **Check Airway**
- 3 **Check breathing**
 - ▶ Give **Oxygen 10-15 L** via reservoir mask
- 4 **Assess circulation**
 - ▶ Assess HR, BP and central and peripheral pulse quality
 - ▶ Confirm diagnosis of Broad Complex Tachycardia on ECG
 - ▶ If not already done so **call Expert help**
- 5
 - ▶ **If conscious but BP Unstable** (Below 5th centile Systolic BP)
 - ▶ **Electrical cardioversion required; call for anaesthetic help**
 - ▶ **Do not delay cardioversion for IV access**
 - ▶ **Give sedation** e.g. IM/Intranasal or IV **ketamine**
 - ▶ **Select Synchronised** option on defibrillator
 - ▶ **1st shock delivered at 1 J kg⁻¹**
 - ▶ **Check ECG, and confirm pulse remains present**
 - ▶ **2nd shock at 2 J kg⁻¹**
 - ▶ **Check ECG, and confirm pulse remains present**
 - ▶ **Recommence oxygenation** between shocks
 - ▶ If no response after three shocks, **Seek Expert Cardiology help**
 - ▶ **If no pulse/signs of life start CPR** ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- 6 **Consider**
 - ▶ **Check history and drug chart** for causes
 - ▶ **Check** bloods and blood gas for serum electrolytes and acid base
 - ▶ Consider **sodium bicarbonate** in face of metabolic acidosis and suspected toxicity
 - ▶ **Consider hypokalemia 2.5-3.3 mmol L⁻¹**

DRUG DOSES and Treatments

KCl⁺ infusion = 0.5 mmol kg⁻¹ h⁻¹ Via central line until arrhythmia resolved/K⁺ >3.5mmol L⁻¹
 (Total dose of 2-3 mmols kg⁻¹ KCl may be required until the patient is clinically stable)

Sodium bicarbonate 8.4%
 1 mmol/kg IV over 20 minutes (if toxicity suspected)

Critical CHANGES

- If VF or pulseless VT ➔ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➔ **NON-SHOCKABLE CARDIAC ARREST 1-3**

Relevant LIFE-TREATENING FEATRUERS

- Shortness of breath
- Chest pain
- Palpitations
- Heart Failure

Synchronised Cardioversion Energy for Broad VT with a pulse

- 1st shock at 1 J kg⁻¹
- 2nd shock at 2 J kg⁻¹

SYNCHRONISED Shock

- Cardioversion requires **synchronised shock** with appropriate sedation.
- When 'Sync' is on, the defibrillator will indicate a marker on the QRS complexes and display a 'sync' message
- When delivering the shock, keep the shock button pressed until the shock is delivered.
- Check that synchronisation is still active after every shock

Post Successful cardioversion.

- Maintain Cardiac monitoring and clinical observations
 - 12 lead ECG
 - Chest X Ray
 - Repeat Serum electrolyte .
- Consider amiodarone infusion after 3rd shock (expert guidance)

4-0 | Tracheostomy Emergency

In the unplanned deterioration of a patient with tracheostomy, airway management is prioritised and modified to account for two possible routes of ventilation

START

- 1 **Call for help and request tracheostomy emergency box or airway trolley**
 - ▶ Call for **Anaesthetics**
 - ▶ Call for **ENT** (Consider calling early if not resident)
- 2 **Apply high flow oxygen to the tracheostomy AND the face**
 - ▶ Apply **waveform capnography** monitoring to the tracheostomy when available
- 3 **Suction to Assess Tracheostomy Patency**
 - ▶ Remove attachments: humidifier (HME), speaking valve
 - ▶ Attempt to **pass a suction catheter**
- 4 **If, able to pass a suction catheter**
 - ▶ **The tracheostomy tube is patent**
 - ▶ Perform tracheal suction
 - ▶ Consider partial obstruction
- 5 **If, unable to pass a suction catheter**
 - ▶ **Emergency tracheostomy change (same size tube)**
 - ▶ **If, unsuccessful try tube half size smaller (trachy box)**
- 6 **Assess Breathing** – Look, listen and feel at the mouth and tracheostomy/stoma
- 7 **If, not breathing** – 5 Rescue Breaths
 - ▶ If, patent upper airway – use the nose/mouth
 - ▶ If, obstructed upper airway – use the tracheostomy/stoma
 - ▶ **If, no pulse/signs of life start CPR**
- 8 **Proceed with Primary Emergency Oxygenation Manoeuvres**
- 9 **If, unsuccessful then proceed to Secondary Emergency Oxygenation Manoeuvres**

Critical CHANGES

- If no signs of life ➔ **CARDIAC ARREST PRIOR TO TEAM ARRIVAL 1-1**

Emergency Tracheostomy Change

- Deflate cuff (if present). Reassess patency after any tube change.
- 1st Change – same size tube
- 2nd Change – one half size smaller tube
- 3rd Change – over suction catheter to guide
- **If unsuccessful – Remove the tube**

Primary Emergency Oxygenation Manoeuvres

Standard Oral Airway manoeuvres

- Cover the stoma (swabs/hands)
- Use:
 - Bag-valve-mask
 - Oral or nasal airway adjuncts
 - Supraglottic Airway (SGA)

Tracheostomy Stoma ventilation

- Paediatric face mask applied to stoma
- SGA applied to stoma

Secondary Emergency Oxygenation Manoeuvres

Oral Intubation with endotracheal tube

- Uncut tube, advance beyond stoma
- One half-size smaller than tracheostomy

Attempt Intubation of Stoma

- 3.0 ID tracheostomy or endotracheal tube

'Difficult airway' – Get expert help and equipment: Fibreoptic scope, bougie, airway exchange catheter, Airway trolley

POST-EVENT actions

- Continue Oxygen
- Stabilize
- Reassess ABCDE
- Plan for definitive airway if tube change failure