Resuscitation Council UK

GUIDELINES 2021

Quick Reference Handbook

Action card guidance for medical and resuscitation emergencies

To ensure you have the most up to date edition, refer to contents page and RCUK website.

This handbook remains the property of

This copy belongs in the following location:

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DO NOT add or remove documents
DO NOT alter the order of the documents

The guidance in this handbook are not intended to be standards of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in light of the clinical data presented, the diagnostic and treatment options available.

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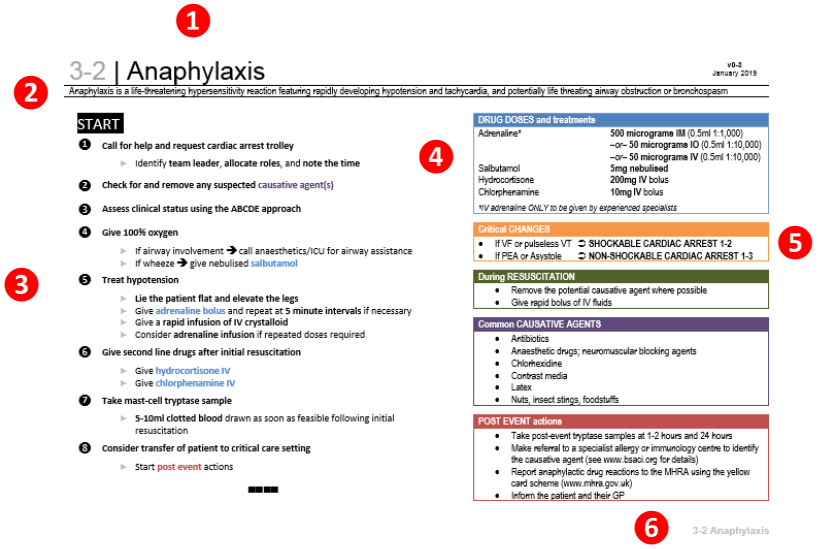
QRH instructions for use

The QRH is intended for use by individuals who are familiar with it and who are practised in its use.

Each action card guidance follows the same format:



1. Guidance number, name and version number.
2. A brief description of the clinical situation for which the guidance is written.
3. The body of the guidance
4. Call out boxes, which may be referred to in the body text.
   - Orange = critical changes
   - Blue = drug doses
   - Green = CPR information
   - Black = equipment instructions
   - Purple = other reference information
   - Red = post-resuscitation care
5. A guidance may suggest changing to one of the other action cards, like this: → **2-1**
6. The guidance number is repeated for easy finding without the need for a tabbed folder.

Each guidance should be used in the same simple way.

- **Start at START.**
- **Work through the numbered bullet points in order.**
- **Where indicated, refer to the call out boxes on the right.**
- **Where indicated, move to another action card.**

We recommend:

- One person should read the guidance aloud; they should NOT be the person performing the actions.
- The reader should ensure that the guidance is followed systematically, thoroughly and completely and that steps are not omitted.
- Whenever experienced help arrives, consider delegating leadership to them; they have a fresh pair of eyes and may be able to make a more clear-headed assessment.

1-1 | Cardiac arrest management prior to team arrival

v0-6
March 2022

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

START

1. **Confirm cardiac arrest and start chest compressions**
2. **Call for help and request resuscitation trolley**
   - Check that **resuscitation team** has been called
   - Call for **patient notes**, **drug charts**, and **observation charts**
3. **Apply defibrillator pads as soon as possible**
   - Apply self-adhesive electrode pads
   - **Minimise interruptions** to chest compressions
4. **Maintain airway and ventilation**
   - Give **100% oxygen** using bag-valve-mask ventilation
   - Apply **waveform capnography** monitoring to airway when available
5. **Check rhythm when defibrillator is connected**
   - Check if rhythm shockable if trained to do so.
     - If shockable ➔ **GUIDANCE 1-2**
     - If non-shockable ➔ **GUIDANCE 1-3**
     - If using an AED - follow its prompts
     - continue to ❻
6. **Start CPR again as soon as rhythm check complete**
   - Check for signs of life after every 2 minutes
7. **Prepare structured handover to emergency team when they arrive**

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Critical CHANGES

- If VF or pulseless VT ➲ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➲ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If pregnant woman ➲ **OBSTETRIC CARDIAC ARREST 1-5**

During RESUSCITATION

- If you are by yourself and no help has arrived, leave the patient to summon help and collect the resuscitation equipment. Return to patient as soon as possible to commence CPR
- Correct CPR technique:
  - Place the heel of one hand in the centre of the chest with the other hand on top and interlock your fingers
  - Keep arms straight and position shoulders vertically over patient
  - Compress to 5-6 cm allowing the chest to recoil afterwards
  - Repeat at a rate of 100-120 min^{-1}
  - Continue CPR 30:2
  - Consider inserting supraglottic airway if trained to do so

Structured HANDOVER

- Situation
- Background
- Assessment
- Recommendation(s)
- Decision

CONTACT NUMBERS

- Resuscitation team:
  - In-hospital: 2222
  - Out-of-hospital: 999
- Other useful numbers:
  - _____
  - _____
  - _____

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

v0-9
March 2022

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**
2. **Call for help and request resuscitation trolley**
   - Identify **team leader**, **allocate roles**, and **note the time**
3. **Apply defibrillation pads**
4. **Check rhythm and pulse:**
   - If shockable ➔ go to step 5
   - If non-shockable ➔ **GUIDANCE 1-3**
   - If return of spontaneous circulation ➔ **post-resuscitation care**
   - Change compressions-provider during check if possible
5. **Deliver safe shock:**
   - Select **shock energy** and charge defibrillator
   - Give **chest compression whilst charging**
   - **Stop** compressions to deliver shock
   - Start **2 minutes** of compressions **immediately** after delivery
6. **Check if drug treatment is needed**
   - Give **adrenaline** after shock 3 then repeat every 3-5 minutes
   - Give **amiodarone** after shocks 3 and 5 only
7. **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 airway
8. **Check for and treat reversible causes**
9. **After 2 minutes ➔ go to step 4**

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DRUG DOSES and treatments

Adrenaline	**1 mg IV / IO**
Amiodarone	**300 mg IV / IO after 3rd shock** *–then–* **150 mg IV / IO after 5th shock**

Critical CHANGES

- If PEA or asystole ➲ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If pregnant woman ➲ **OBSTETRIC CARDIAC ARREST 1-5**
- If K^+ > 6.5 mmol L^{-1} ➲ **SEVERE HYPERKALAEMIA 3-5**

During RESUSCITATION

- 30 compressions to 2 rescue breaths,100-120 min^{-1}, depth 5-6 cm
- Continuous compressions once airway secured
- Check for reversible causes ➲ **ASSESSMENT OF REVERSIBLE CAUSES DURING CARDIAC ARREST 1-4**

Shock energy

- Defibrillation energy in this trust: _____
- If unsure about shock energy, use maximum available

REVERSIBLE CAUSES

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

*Ultrasound may assist detection

POST-RESUSCITATION CARE

- Check ABCDE, ECG, CXR, and ABG
- Aim for SpO_2 94-98%, normal $PaCO_2$
- Targeted temperature management
- Treat precipitating cause
- Consider transfer of patient to critical care setting

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

v0-11
March 2022

Asystole or PEA on ECG with no pulse or signs of life. The key treatment is early CPR.

START

1. **Confirm cardiac arrest and start CPR**
2. **Call for help and request resuscitation trolley**
   - Identify **team leader**, **allocate roles**, and **note the time**
3. **Apply defibrillation pads**
4. **Check rhythm and pulse:**
   - If non-shockable ➔ go to step 5
   - If shockable ➔ **GUIDANCE 1-2**
   - If return of spontaneous circulation ➔ **post-resuscitation care**
   - Change compressions-provider during check if possible
5. **Start 2 minutes of CPR**
   - Give adrenaline then repeat every **3-5 min**
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 airway
7. **Check for and treat reversible causes**
8. **After 2 minutes ➔ go to step 4**

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DRUG DOSES and treatments

Adrenaline	**1 mg IV / IO bolus**

If invasively monitored and severe refractory hypotension give 50 microgram increments of adrenaline titrated to effect

Critical CHANGES

- If VF or pulseless VT ➲ **SHOCKABLE CARDIAC ARREST 1-2**
- If pregnant woman ➲ **OBSTETRIC CARDIAC ARREST 1-5**
- If K^+ > 6.5 mmol L^{-1} ➲ **SEVERE HYPERKALAEMIA 3-5**
- If severe bleeding ➲ **MASSIVE HAEMORRHAGE 3-6**

During RESUSCITATION

- 30 compressions to 2 rescue breaths, 100-120 min^{-1}, depth 5-6 cm
- Continuous compressions once airway secured
- Insert vascular access (intravenous or intraosseous)
- Check for reversible causes ➲ **ASSESSMENT OF REVERSIBLE CAUSES DURING CARDIAC ARREST 1-4**

REVERSIBLE CAUSES

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

*Ultrasound may assist detection

POST-RESUSCITATION CARE

- Check ABCDE, ECG, CXR, and ABG
- Aim for SpO_2 94-98%, normal $PaCO_2$
- Targeted temperature management
- Treat precipitating cause
- Consider transfer of patient to critical care setting

1-4 | Assessment of reversible causes during cardiac arrest

v0-9
Mar 2022

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

START

1. **Check for hypoxaemia (PaO_2 < 10 kPa)**
   - Give **100% oxygen** using bag-valve-mask *–and–* check device correctly connected
   - Insert **supraglottic airway** *–or–* **tracheal tube** if trained to do so
   - Check chest movement and air entry
2. **Check for hypovolaemia**
   - Check for haemorrhage, occult bleeding, or fluid loss
3. **Check for hypo/hyperkalaemia and electrolyte abnormalities**
   - Check potassium, calcium, and glucose on ABG
   - Check serum magnesium
4. **Check for hypothermia**
   - Check using low reading thermometer if necessary
5. **Check for thrombosis (pulmonary or coronary)**
   - Check for signs of DVT or relevant prior history
   - Consider focused cardiac ultrasound
6. **Check for tamponade (cardiac)**
   - Consider focused cardiac ultrasound
7. **Check for tension pneumothorax**
   - Check bilateral air entry, chest movement, and airway pressure
   - Check for tracheal deviation
   - Consider focused chest ultrasound
8. **Check for toxins**
   - Check drug chart and clinical notes

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DRUG DOSES and treatments

CARDIAC ARREST treatment

Potassium chloride	**20 mmol IV** over **10 min** *–then–* **10 mmol IV** over **5-10 min**
Magnesium sulfate 50%	**2 g IV** over **1-2 min**
Tenecteplase	**500-600 micrograms kg^{-1} IV** bolus *–or–*
Alteplase	**50 mg IV** bolus *–then–* if still in cardiac arrest **50 mg IV** bolus after 30 minutes

Critical CHANGES

- If VF or pulseless VT ➲ **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**
- If severe bleeding ➲ **MASSIVE HAEMORRHAGE 3-6**

During RESUSCITATION

- Give IV/IO fluids or blood as required
- If serum potassium < 3.5mmol L^{-1} ➔ give potassium chloride
- If serum magnesium < 0.65mmol L^{-1} ➔ give magnesium sulfate 50%
- If hypothermia ➔ start active warming and warmed fluids
- If cardiac event ➔ consider thrombolysis during resuscitation
- If PE ➔ consider fibrinolytic drugs (e.g. alteplase)
- If toxins ➔ check for relevant reversal agents

Other reference information

- Use waveform capnography if advanced airway inserted
- For prolonged resuscitation consider mechanical chest compression device if available
- Consider extracorporeal CPR (ECPR) if available
- Consider dialysis if available

Resuscitation Council UK
MBRRACE-UK Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK
Obstetric Anaesthetists' Association Promoting the highest standards of anaesthetic practice in the care of mother and baby
GUIDELINES 2021
v1-1
August 2021

1-5 | Obstetric cardiac arrest

Alterations in maternal physiology and exacerbations of pregnancy related pathologies must be considered. Priorities include calling the appropriate team members, relieving aortocaval compression, effective cardiopulmonary resuscitation (CPR), consideration of causes and performing a timely emergency hysterotomy (perimortem caesarean section) when ≥ 20 weeks.

START

1. **Confirm cardiac arrest** and **call for help. Declare 'Obstetric cardiac arrest'**
   - Team for mother and team for neonate if > 20 weeks
2. **Lie flat, apply manual uterine displacement to the left**
   - Or left lateral tilt (from head to toe at an angle of 15–30° on a firm surface)
3. **Commence CPR** and request **resuscitation trolley**
   - Standard CPR ratios and hand position apply
   - **Evaluate potential causes** (Box A)
4. **Identify team leader, allocate roles including scribe**
   - Note time
5. **Apply defibrillation pads and check cardiac rhythm** (defibrillation is safe in pregnancy and no changes to standard shock energies are required)
   - if VF/pulseless VT ➔ defibrillation and first adrenaline and amiodarone after 3rd shock
   - If PEA/asystole ➔ resume CPR and give first adrenaline immediately
   - Check rhythm and pulse every 2 minutes
   - Repeat adrenaline every 3-5 minutes
6. **Maintain airway and ventilation**
   - Give 100% oxygen using bag-valve-mask device
   - Insert supraglottic airway with drain port *–or–* tracheal tube if trained to do so (intubation may be difficult, and airway pressures may be higher)
   - Apply waveform capnography monitoring to airway
   - If expired CO_2 is absent, presume oesophageal intubation until absolutely excluded
7. **Circulation**
   - I.V. access above the diaphragm, if fails or impossible use upper limb intraosseous (IO)
   - See Box B for reminders about drugs
   - Consider extracorporeal CPR (ECPR) if available
8. **Emergency hysterotomy (perimortem caesarean section)**
   - Perform if ≥ 20 weeks gestation, to improve maternal outcome
   - Perform immediately if maternal fatal injuries or prolonged pre-hospital arrest
   - Perform by 5 minutes if no return of spontaneous circulation
9. **Post resuscitation from haemorrhage - activate Massive Haemorrhage Protocol**
   Consider uterotonic drugs, fibrinogen and tranexamic acid
   Uterine tamponage/sutures, aortic compression, hysterectomy

Box A: POTENTIAL CAUSES *4H's and 4T's* (specific to obstetrics)

Hypoxia	Respiratory – Pulmonary embolus (PE), Failed intubation, aspiration Heart failure Anaphylaxis Eclampsia / PET – pulmonary oedema, seizure
Hypovolaemia	Haemorrhage – obstetric (remember concealed), abnormal placentation, uterine rupture, atony, splenic artery/hepatic rupture, aneurysm rupture Cardiac – arrhythmia, myocardial infarction (MI) Distributive – sepsis, high regional block, anaphylaxis
Hypo/hyperkalaemia	Also consider blood sugar, sodium, calcium and magnesium levels
Hypothermia	
Tamponade	Aortic dissection, peripartum cardiomyopathy, trauma
Thrombosis	Amniotic fluid embolus, PE, MI, air embolism
Toxins	Local anaesthetic, magnesium, illicit drugs
Tension pneumothorax	Entonox in pre-existing pneumothorax, trauma

Box B: IV DRUGS FOR USE DURING CARDIAC ARREST

Fluids	**500 mL IV** crystalloid bolus
Adrenaline	**1 mg IV** every 3-5 minutes in non-shockable or after 3rd shock
Amiodarone	**300 mg IV** after 3rd shock
Atropine	**0.5-1 mg IV** up to 3 mg if vagal tone likely cause
Calcium chloride	**10% 10 mL** IV for Mg overdose, low calcium or hyperkalaemia
Magnesium	**2 g IV** for polymorphic VT / hypomagnesaemia, **4 g IV** for eclampsia
Thrombolysis/PCI	For suspected massive pulmonary embolus / MI
Tranexamic acid	**1 g** if haemorrhage
Intralipid	**1.5 mL kg^{-1} IV** bolus and **15 mL kg^{-1} hr^{-1} IV** infusion

2-1 | Bradycardia

v0-5
October 2021

An abnormally slow heart rate causing haemodynamic compromise. Heart rates under 40 min^{-1} are often tolerated poorly, especially in patients with heart disease.

START

1 Call for help and request resuscitation trolley

- Request defibrillator with **pacing module**
- Attach **ECG leads** and **defibrillator pads**

2 Give oxygen

- Apply oxygen at **15 L min^{-1} via reservoir mask** initially
- Titrate to SpO_2 94-98% when monitoring available

3 Perform ABCDE assessment and check for life threatening features

- Check 12-lead ECG for rhythm and signs of ischaemia
- Check serum electrolytes and drug history

4 Give atropine boluses to total dose of 3 mg

- If bradycardia secondary to **beta-blocker** or **calcium channel blocker** ➔ give **glucagon**
- If bradycardia secondary to **digoxin** ➔ call **expert help**

5 Consider risk of deterioration

- If **risk of asystole** ➔ prepare **pacing**
- If poor response to atropine ➔ prepare **pacing**
- If pacing required but unavailable ➔ consider **adrenaline** *–or–* **isoprenaline** *–or–* **dopamine**

6 If pacing required

- Call anaesthetic/ICU for support with sedation
- Apply defibrillator pads and 3-lead monitoring in conventional positions (consider antero-posterior pad position if implanted device or trauma)
- Start **pacing** and assess response clinically
- After electrical capture set pacer output to 10 mA above capture point
- Check pulse and blood pressure

7 Call for expert help to assess need for trans-venous pacing

DRUG DOSES and treatments

Atropine*	**500 micrograms IV bolus**
Adrenaline	**2-10 micrograms min^{-1} IV infusion**
Isoprenaline	**5 micrograms min^{-1} IV infusion**
Dopamine	**2.5-10 micrograms kg^{-1} min^{-1} IV infusion**
Glucagon	**2-10 mg IV** in **glucose 5%** *–then–* **50 micrograms kg^{-1} h^{-1} IV infusion**

**do NOT give atropine to patients with a transplanted heart*

Critical CHANGES

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

Relevant LIFE THREATENING FEATURES

- Signs of cardiac ischaemia
- Syncope
- Cardiac failure
- Shock

Factors increasing RISK OF ASYSTOLE

- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS complexes
- Ventricular pauses greater than 3 seconds

Pacing TARGETS

- Set pacer rate to 60-90 min^{-1}
- Increase pacer output until capture (often 50-100 mA)
- If reach maximum output without capture, change pad position
- Demand mode unless significant motion artefact
- It is safe for staff to touch patients receiving transcutaneous pacing

2-2 Compromised tachycardia

v0-4
March 2022

Tachyarrhythmia causing haemodynamic compromise. Synchronised cardioversion is the mainstay of treatment.

START

1 Call for help and request resuscitation trolley

- Start ABCDE assessment to confirm **life threatening features**
- Attach **ECG leads** and **defibrillator pads**
- Check 12-lead ECG
- Check **history** and **drug chart** for causes of tachycardia
- Check **serum electrolytes** and take sample for **blood gas** analysis

2 If conscious ➔ give sedation

- Call **anaesthetics/ICU** for assistance
- Sedative drug doses likely to be lower than usual, and slower in onset
- Consider fasting state when planning sedation

3 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 ➔ call expert help *–then–* give **amiodarone bolus** *–then–* give fourth shock *–then–* give **amiodarone infusion**

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DRUG DOSES and treatments

Amiodarone bolus	**300 mg IV** over **10-20 min**
Amiodarone infusion	**900 mg IV** over **24 h** via central line

Critical CHANGES

If VF or pulseless VT➲ **SHOCKABLE CARDIAC ARREST 1-2**
If PEA or asystole ➲ **NON-SHOCKABLE CARDIAC ARREST 1-3**
No life threatening features ➲ **NON-COMPROMISED TACHYCARDIA 2-3**

Relevant LIFE THREATENING FEATURES

- Signs of cardiac ischaemia
- Syncope
- Cardiac failure
- Shock

Cardioversion ENERGY

Broad complex:

- 120-150 J initially then increasing incrementally

AF:

- Start at maximum defibrillator energy setting

Narrow complex or atrial flutter:

- 70-120 J initially then increasing incrementally

SYNCHRONISED Shock

- Cardioversion requires synchronised shock (unsynchronised risks VF)
- When synchronising, the defibrillator will highlight QRS complexes and display a ‘sync’ message
- For atrial rhythms use antero-posterior pad position if possible
- When giving shock, keep button pressed until shock delivered
- Check if synchronisation still active after every shock

3-1| Altered consciousness

v0-7
March 2022

New onset confusion, decrease in GCS of > 2 points or repeated or prolonged seizures

START

1 Check Airway

- If evidence of **obstruction** or partial obstruction ➔ call anaesthetics/ICU and apply airway manouevres
- If airway unprotected ➔ turn patient to **lateral position**

2 Check Breathing

- If breathing inadequate ➔ call **anaesthetics/ICU**
- Apply oxygen at **15 L min^{-1} via reservoir mask** initially
- Titrate to SpO_2 94-98% when monitoring available
- if saturations do not improve on oxygen ➔ call for bag-valve-mask *–then–* support breathing
- If respiratory rate < 8 and recent **opioid** use ➔ give **naloxone**
- Take **ABG**

3 Check Circulation

- If **hypotensive** ➔ give crystalloid **fluid challenge**

4 Check Disability using either ACVPU *–or–* GCS

- Check **pupils** for size, equality, and reaction to light
- If recent **benzodiazepine** use ➔ give **flumazenil**
- Check blood glucose
  - If **hypoglycaemia** ➔ give **dextrose**
  - If **hyperglycaemia** ➔ check ketones and start fixed-rate **insulin infusion**

5 Check Exposure

- **Examine** patient thoroughly
- Check **temperature**

6 Identify and treat common causes

7 Consider CT head scan

8 Consider transfer of patient to critical care setting

DRUG DOSES and treatments

Dextrose 10%*	**50 mL IV** *–then–* repeat every 60 s until patient conscious *–or–* **250 mL** total given
Flumazenil†	[specialist use] **200 micrograms IV** *–then–* **100 micrograms** every 60s until patient conscious –or– **1 mg** total given
Fixed rate insulin infusion*	**soluble insulin 1 unit mL^{-1}** at **0.1 units kg h^{-1}**
Glucagon*	**1mg IM** bolus *–then–* 10% dextrose
Naloxone	**400 micrograms IV** *–or–* **800 micrograms IM** *–or–* **800 micrograms SC** *–or–* **2 mg intranasal**

Initial fluid challenge

- No cardiac failure: 500 mL IV crystalloid bolus
- Cardiac failure: 250 mL IV crystalloid bolus

**check local protocols †give only after expert advice*

Critical CHANGES

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

Common CAUSES

- Profound hypoxia or hypercapnia
- Profound hypotension
- Hypoglycaemia (blood glucose < 4 mmol L^{-1})
- Cerebral hypoperfusion or head injury
- Recent administration of sedatives or analgesic drugs
- Intracerebral disease

3-2a | Anaphylaxis

v0-8
March 2022

Anaphylaxis is a life-threatening hypersensitivity reaction featuring rapidly developing hypotension and tachycardia, and potentially life-threating airway obstruction or bronchospasm

START

1. **Call for help and consider requesting resuscitation trolley**
   - Identify **team leader**, **allocate roles**, and **note the time**
2. **Assess clinical status using the ABCDE approach**
   - Check patient position
   - If **respiratory distress** ➔ sit the patient **upright**
   - If **hypotension** ➔ lie the patient **flat** *–and–* **elevate the legs**
   - Check airway *–and–* give **oxygen**
   - If airway involvement ➔ call **anaesthetics/ICU**
3. **Treat anaphylaxis**
   - Give **adrenaline** *–and–* repeat at **5 minute intervals** if no improvement
   - Give a **rapid bolus of IV crystalloid**
   - Check for and remove any suspected **causative agent(s)**
4. **Check the patient's response**
   - If no improvement after two doses of IM adrenaline state '**refractory anaphylaxis**' *–then–* go to **REFRACTORY ANAPHYLAXIS 3-2b**
5. **Take mast-cell tryptase sample**
   - **5-10 mL clotted blood** drawn as soon as feasible following initial resuscitation
6. **Consider transfer of patient to critical care setting**
   - Start **post-event** actions

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DRUG DOSES and treatments

Adrenaline bolus*	**500 micrograms IM** to anterolateral aspect of mid-thigh *–or–* [specialist use] **50 micrograms IO/IV**
Oxygen	**15 L min^{-1}** via **reservoir mask** *–then–* **titrate** to SpO_2 94-98%

IM generally 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**
- If refractory anaphylaxis ➲ **REFRACTORY ANAPHYLAXIS 3-9**

During RESUSCITATION

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

Common CAUSATIVE AGENTS

- Antibiotics
- Anaesthetic drugs; neuromuscular blocking drugs
- Chlorhexidine
- Contrast media
- 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 and their GP

3-2b | Refractory Anaphylaxis

v0-3
March 2022

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

START

1. **Call for anaesthetics/ICU if not already present**
2. **Start continuous monitoring if not already started**
   - 3-lead ECG
   - Pulse oximetry
   - Blood pressure on automatic cycle (at least every 5 minutes)
3. **Start adrenaline infusion**
   - Repeat **adrenaline boluses** at 5 minute intervals until infusion started
4. **Check the patient's response**
   - If ongoing shock ➔ give **rapid bolus(es) of IV crystalloid** *–and–* give **steroid treatment**
   - If severe or persistent wheeze ➔ give nebulised **salbutamol** *–and–* give **steroid treatment**
5. **Take mast-cell tryptase sample**
   - **5-10 mL clotted blood** drawn as soon as feasible following initial resuscitation
6. **Transfer of patient to critical care setting**
   - Start **post-event** actions

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DRUG DOSES and treatments

Adrenaline bolus*	Adrenaline bolus* **500 micrograms IM** to anterolateral aspect of mid-thigh *–or–* [specialist use] **50 micrograms IO / IV**
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}**
Salbutamol	**5 mg nebulised**
Oxygen	**15 L min^{-1}** via **reservoir mask** *–then–* **titrate** to SpO_2 94-98%
Crystalloid bolus	e.g. **500-1000 mL 0.9% sodium chloride** per bolus, titrated to response
Steroid treatment	**prednisolone PO** if possible *–or–* **hydrocortisone IV** if PO route unavailable

IM generally 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

v0-5
March 2022

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

START

1. **Call for help and consider requesting resuscitation trolley**
   - Identify **team leader**, **allocate roles**, and **note the time**
2. **Check clinical status using the ABCDE approach**
   - Check for **symmetrical breath sounds** and **chest movements**
   - Check **respiratory rate**, **SpO_2**, **peak expiratory flow rate**, and consider **ABG**
3. **Give oxygen**
   - Apply oxygen at **15 L min^{-1} via reservoir mask** initially
   - Titrate to SpO_2 94-98% when monitoring available
4. **If severe or life-threatening features ➔ call anaesthetics/ICU urgently**
5. **Start nebulised bronchodilators**
   - Give nebulised **salbutamol** once (continuously if **severe** or **life-threatening**)
   - Give nebulised **ipratropium** once
6. **Start steroid therapy**
7. **Consider IV crystalloid fluid challenge(s)**
8. **Consider IV therapy if limited response to nebulisers**
   - Apply **cardiac monitoring**
   - Start **IV magnesium**
   - Check **electrolytes**
9. **If poor response to IV magnesium ➔ call anaesthetics/ICU urgently**
   - Consider **IV salbutamol** *–or–* **IV aminophylline** only after discussion with senior medical staff *–and–* where the situation is **life-threatening**
10. **Consider transfer of patient to critical care setting**
    - If **tracheal intubation** required ➔ consider **ketamine**
    - Airway pressures likely to be high initially

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DRUG DOSES and treatments

Salbutamol	**5 mg nebulised** via **oxygen** **250 micrograms IV** over **5-10 minutes**
Ipratropium bromide	**500 micrograms nebulised** via **oxygen**
Steroid therapy	**100 mg IV hydrocortisone** bolus *–or–* **40 mg PO prednisolone**
Magnesium sulfate	**2 g IV** over **20 min**
Aminophylline	[specialist use] **5 mg kg^{-1} IV** over **20 min*** *–then–* **0.5-0.7 mg kg^{-1} hr^{-1} IV** infusion

**omit loading dose if taking PO theophylline and monitor levels regularly*

Critical CHANGES

- If VF or pulseless VT➲ **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 desirable
- Take care to exclude tension pneumothorax and gas trapping
- Extra-corporeal life support may be successful

Features of SEVERE asthma

- PEF 33-50% predicted
- Respiratory rate ≥ 25 min^{-1}
- Heart rate 110 ≥ min^{-1}
- Inability to complete sentence in single breath

Features of LIFE-THREATENING/NEAR FATAL asthma

- PEF < 33% predicted
- SpO_2 < 92% or PaO_2 < 8 kPa
- $PaCO_2$ ≥ 4.6 kPa)
- Silent chest, cyanosis, poor respiratory effort, or exhaustion
- Arrhythmia or hypotension
- Altered conscious level

3-4| Choking

v0-7
March 2022

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

START

1. **Call for help and consider requesting resuscitation trolley**
   - Position patient upright
2. **Give up to 5 back blows**
3. **Check if airway remains obstructed**
   - **Stop** if airway cleared
4. **Give up to 5 abdominal thrusts**
5. **Check if airway remains obstructed**
   - **Stop** if airway cleared
6. **Give 5 back blows and 5 abdominal thrusts alternately**
   - **Stop** if airway cleared
7. **If patient conscious but no improvement ➔ call anaesthetics –*and*– ENT**
   - Retrieval of foreign body under anaesthesia likely to be required
   - Nasendoscopy may assist localisation of foreign body
   - Prepare for transfer to theatre
     - Anaesthetist and surgeon should prepare airway management plan and choice of airway device
     - Give IV dexamethasone
     - Prepare suction and equipment for difficult intubation
     - Maintain spontaneous respiration during induction if possible
     - Trans-nasal humidified rapid insufflation ventilatory exchange (THRIVE) with device e.g. Optiflow may be helpful if IV induction necessary
     - If material below the glottis ➔ prepare for rigid bronchoscopy

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DRUG DOSES and treatments

Oxygen	**High-flow** via **bag-mask** during cardiac arrest
Dexamethasone	**6.6 mg IV bolus**

CARDIAC ARREST treatment

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

**specific airway training required*

Critical CHANGES

If patient loses consciousness commence CPR:

- If VF or pulseless VT ➲ **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 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 heel of one hand between the scapulae
- Check between each blow to see if obstruction has been relieved

ABDOMINAL THRUSTS

- Stand behind patient
- Place a fist under the xiphisternum
- Pull sharply inwards and upwards
- Check between each abdominal thrust to see if obstruction has been relieved

3-5 | Severe Hyperkalaemia

v0-6
March 2022

Serum potassium greater than 6.5 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 clinical status using the ABCDE approach**
3. **Apply continuous cardiac monitoring**
4. **Give calcium if ECG changes**
   - Can be repeated every **10-15 minutes** if ECG changes persist
5. **Give nebulised salbutamol**
6. **Start insulin/dextrose infusion**
   - Check **serum potassium** and **blood glucose** after treatment
7. **If hyperkalaemia persists ➔ consider need for emergency dialysis**
   - Call **ICU** or **renal team** if required
8. **Check for and remove any suspected causative agent(s)**
   - Check **drug chart**
   - Check **infusions** connected to patient

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DRUG DOSES and treatments

Calcium Therapy	**10 mL IV 10% calcium chloride** over **2-5 min** *–or–* **30 mL IV 10% calcium gluconate** **2-5 min**
Insulin/Dextrose infusion	**10 units short-acting insulin** in **50 mL 50% dextrose** (25 g glucose) over **15 min**
Salbutamol	**10-20 mg nebulised**

CARDIAC ARREST treatment

Sodium bicarbonate	**50 mmol IV** bolus (50 mL 8.4% solution)

Critical CHANGES

- If VF or pulseless VT ➲ **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 chloride *–or–* calcium gluconate by rapid bolus
- Give insulin/dextrose by rapid bolus
- Give sodium bicarbonate by rapid bolus
- Consider dialysis if hyperkalaemia resistant to medical therapy

Common CAUSATIVE AGENTS

- ACE inhibitors/Angiotensin II receptor antagonists
- Potassium-sparing diuretics
- Non-steroidal anti-inflammatory drugs
- Beta-blockers
- Trimethoprim
- Potassium supplements and IV infusions

3-6 | Massive haemorrhage

v0-5
October 2021

Uncontrolled haemorrhage is the cause of traumatic cardiac arrest in 48% of cases, and early haemorrhage control is essential. Remember that even major bleeding may be concealed.

START

1 Call for help and consider requesting resuscitation trolley

- Declare **'major haemorrhage'**
- Call **anaesthetic** and/or **surgical/radiological support** if appropriate

2 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)

3 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

4 Give IV fluid challenge(s) or blood products

- Start **fluid warmer**
- Give blood products as early as possible
- Apply **pressure bag** to fluids or use **rapid-infusion device**

5 Give medical management

- Give **tranexamic acid**
- Check for **hypocalcaemia**
- Reverse anticoagulant drugs

6 Insert urinary catheter and check urine output hourly

7 Reassess patient regularly

- Check **temperature, FBC, clotting, fibrinogen, potassium and lactate**
- Check for **cardiac failure**

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DRUG DOSES and treatments

Tranexamic acid	**1 g IV** over **10 min** *–then–* **1 g IV** over **8 h**
Calcium replacement	**10 mL IV 10% calcium chloride** *–or–* **30 mL IV 10% calcium gluconate**
Initial fluid challenge	**250 mL crystalloid bolus** until blood available

Critical CHANGES

- If infection found ➲ **SEPSIS 3-8**
- If K^+ > 6.5 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

Considerations for 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 low or bleeding prolonged
- Early involvement of the haematologist on call is helpful

3-7 | Massive pulmonary embolism (PE)

v0-7
March 2022

Diagnostic features of massive PE include hypotension (systolic < 90/drop of 40 mmHg for >15 mins) and signs of tissue hypoperfusion in the context of known or suspected venous thromboembolism. Cardiac arrest may be a presenting or complicating feature.

START

1 Call for help and consider requesting a resuscitation trolley

- Identify **team leader**, **allocate roles**, and **note the time**

2 Check clinical status using the ABCDE approach

- Check for **symmetrical breath sounds** and **chest movements**
- Check **respiratory rate**, **SpO_2,** and consider **ABG**
- Check **ECG** and consider bedside **echocardiography** if available
- Check **Wells score for PE**
- Check **D-dimer** and **eGFR**

3 Give oxygen

- Apply oxygen at **15 L min^{-1} via reservoir mask** initially
- Titrate to SpO_2 94-98% when monitoring available

4 Prepare for CTPA

- If high-risk Wells score ➔ **CTPA immediately**
- Anticoagulation **prior to scan** if CTPA **cannot** be carried out immediately

5 Give anticoagulation after CTPA (if not already started)

- If eGFR < 30 mL min^{-1}/ 1.73 m^2 or increased risk bleeding ➔ give **unfractionated heparin**
- If haemodynamic instability ➔ call for **expert advice** *–then–* give **unfractionated heparin** *–and–* **fibrinolysis** (**tenecteplase** *–or–* **alteplase**)
- Otherwise ➔ give **fondaparinux** *–or–* **low-molecular weight heparin**

6 Consider transfer of patient to critical care setting

- Consider the use of extracorporeal membrane oxygenation if available

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DRUG DOSES and treatments

Unfractionated Heparin	**5,000-10,000 units IV** bolus *–then–* **18 units kg^{-1} hr^{-1} IV** infusion*
Fondaparinux	Weight <50 kg: **5 mg SC** OD 50-100 kg: **7.5 mg SC** OD >100 kg: **10 mg SC** OD
Low-molecular weight heparin	
▸ Dalteparin:	**200 units kg^{-1} SC** OD
▸ Enoxaparin:	**1.5 mg kg^{-1} SC** OD if uncomplicated *–or–* **1 mg kg^{-1} SC** BD if complicated

**monitor APTTr regularly*

CARDIAC ARREST Treatment

Tenecteplase	**500-600 micrograms kg^{-1} IV** bolus *–or–*
Alteplase	**50 mg IV** bolus *–then–* if still in cardiac arrest
	50 mg IV bolus after 30 minutes

Critical CHANGES

- If VF or pulseless VT➲ **SHOCKABLE CARDIAC ARREST 1-2**
- If PEA or asystole ➲ **NON-SHOCKABLE CARDIAC ARREST 1-3**
- If pregnant woman ➲ **OBSTETRIC CARDIAC ARREST 1-5**

During RESUSCITATION

- Consider fibrinolysis (tenecteplase/alteplase) early if suspect PE
- Thrombectomy and extracorporeal CPR options in larger centres
- Prepare for prolonged CPR after fibrinolysis

WELLS Score for Pulmonary Embolism

PE likely if four or more points from:

• Clinical signs and symptoms of DVT	3
• Alternative diagnosis less likely than PE	3
• Heart rate > 100	1.5
• Immobilisation for > 3 days or surgery in last month	1.5
• Previous DVT/PE	1.5
• Haemoptysis	1
• Malignancy	1

3-8 | Sepsis

v0-7
March 2022

Sepsis: life-threatening organ dysfunction caused by a dysregulated host response to infection.
Septic shock: patient in whom vasopressors are required to maintain mean arterial pressure of ≥ 65 mmHg, and serum lactate >2 mmol L^{-1}, despite adequate volume resuscitation.

START

1. **Call for help and consider requesting resuscitation trolley**
   - Identify **team leader**, **allocate roles**, and **note the time**
2. **Check clinical status using the ABCDE approach**
3. **Give oxygen**
   - Apply oxygen at **15 L min^{-1} via reservoir mask** initially
   - Titrate to SpO_2 94-98% when monitoring available
4. **Insert IV cannula if not already present**
5. **If systolic blood pressure < 90 mmHg *-or-* lactate raised ➔ give fluid challenge**
   - Call senior decision maker for immediate review
6. **Check bloods for**:
   - **Venous blood gas** (including **lactate**)
   - **Blood culture**
   - **FBC**, **U&Es**, **CRP**, **clotting**
7. **Give IV antibiotics immediately - Check patient allergy status before prescribing**
8. **Check for source of sepsis**
   - **Treat source**
   - Send **source cultures** if possible
9. **Consider urethral catheterisation to monitor hourly urine output**
10. **Call senior clinical decision maker (if not already contacted)**
11. **Repeat clinical observations at least every 30 minutes**
12. **Consider transfer of patient to critical care setting**

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 source known.
Initial fluid challenge	
▸ No cardiac failure:	500 mL^{-1} IV crystalloid bolus
▸ Cardiac failure:	consider reducing volume given

Critical CHANGES

- If VF or pulseless VT➲ **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

- Regular clinical observations and calculation of NEWS2 score essential.
- Arterial blood gas sampling may be necessary if respiratory involvement.
- Source identification include: thorough physical examination, urine cultures, chest radiography and abdominal/pelvic imaging.
- Source control may require specialist input (e.g. surgical intervention).
- Request patient notes to review any recent antibiotic treatment.
- Consider early discussion with microbiology.
- Refer for critical care if hypotensive despite initial fluid resuscitation