

## Adult cardiopulmonary arrest

When attending a possible cardiac arrest situation, implement your (well-practised) basic and advanced life support training as follows:

### Initial assessment<sup>[1]</sup>

- Ensure personal safety, ie that the patient, any bystanders and yourself are safe.
- If you witness a collapse or find a patient apparently unconscious: initially shout for help, then assess whether the patient is responsive by gently shaking their shoulders.

### Responsive

- Ensure they are in a comfortable position.
- Try to find out what caused the collapse and get help if needed.
- Reassess them regularly (using ABCD algorithm) and record vital signs.
- If collapse occurs in hospital, call for an urgent medical assessment (follow local protocol), give oxygen (monitor with pulse oximetry), obtain venous access and arrange appropriate handover to the medical team.

### Unresponsive

Dial 999 if in the UK (or an appropriate emergency number if in another country), or, if in hospital, call for the resuscitation team, unless the patient has previously expressed a wish not to be resuscitated.<sup>[2]</sup>

Assess the patient using the ABCD approach:

#### **A = Airway**

- Turn the victim on to their back and then open the airway using head tilt and chin lift:
  - Place your hand on their forehead and gently tilt their head back.
  - With your fingertips under the point of the victim's chin, lift the chin to open the airway.

## **B = Breathing**

- Keeping the airway open, look for chest movement and signs of breathing (for a maximum of 10 seconds).
- Ignore any agonal breathing (occasional gasps, slow, laboured, or noisy breathing) which is common in the early stages of cardiac arrest - it should not be taken as a sign of life.
- If breathing, turn into the recovery position. Check help has been called and continually assess that breathing remains normal.
- If there is any doubt about the presence of normal breathing, start chest compressions (see below).

## **C = Circulation**

- **If not clearly breathing, begin CPR (30:2): repeated cycles of 30 chest compressions then two rescue breaths:**
  - Minimise interruptions to CPR (plan actions before interrupting) and ensure it is performed adequately:
    - Rate: aim for 100-120/minute.
    - Depth: aim to compress sternum by 5-6 cm in an adult.
    - Recoil: allow chest to completely recoil between compressions.
  - Rescue breaths are ideally delivered over one second each, via a ventilation bag and mask with oxygen supply; however, use a pocket mask, or mouth-to-mouth or mouth-to-nose technique if not available. The two breaths should take more than a total of five seconds.
  - Use simple airway adjuncts (oropharyngeal or nasopharyngeal airways) when available (but ensure chest compressions are interrupted for as little time as possible).
- If rescue breaths do not cause the chest to rise:
  - Check the victim's mouth and remove any visible obstruction.
  - Recheck that there is adequate head tilt and chin lift.
- Don't attempt more than two breaths each time before returning to chest compressions.
- Change the person giving chest compressions each two minutes if possible (to avoid fatigue resulting in inadequate compressions).
- Only stop CPR cycles to recheck the victim if they start to show signs of regaining consciousness.

#### **D = Defibrillation (if available)**

- When the defibrillator arrives, apply the electrodes to the patient and analyse the rhythm. The use of adhesive electrode pads or the 'quicklook' paddles technique will enable rapid assessment of heart rhythm compared with attaching ECG electrodes.

- If using an automated external defibrillator (AED), follow the voice prompts; if using a manual defibrillator, follow the heart rhythm assessment algorithm below.
- Always complete two minutes of CPR between each single defibrillation attempt. Give adrenaline (epinephrine) and amiodarone after the third shock, if available, and further adrenaline (epinephrine) after alternate two-minute cycles of CPR thereafter.
- Continue resuscitation until the resuscitation team arrives or the patient shows signs of life.

## Heart rhythm assessment (in ambulance or hospital) <sup>[1]</sup>

Cyclically repeat the following two points, until successful or until resuscitation is deemed unsuccessful:

- Momentarily interrupt CPR for assessment of heart rhythm on monitor after each two-minute cycle, and perform one defibrillation attempt per cycle if indicated:
  - Ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), or any shockable rhythm:
    - Defibrillation recommended - perform one shock (150–200 J biphasic for the first shock and 150–360 J biphasic for subsequent shocks; or 360 J monophasic).
    - Immediately resume chest compressions (30:2) without reassessing the rhythm or feeling for a pulse for a further two-minute cycle before further assessment.
    - Give adrenaline (epinephrine) 1 mg intravenously (IV) and amiodarone 300 mg IV after the third shock. Repeat the adrenaline (epinephrine) every three to five minutes afterwards (during alternate cycles of CPR).
    - Correct any reversible causes. If there is doubt as to whether rhythm is fine VF or asystole, defibrillation is not recommended.
  - Pulseless electrical activity (PEA) or asystole: ie defibrillation not recommended - give adrenaline (epinephrine) 1 mg IV as soon as there is venous access, continue CPR and correct any reversible causes. Repeat adrenaline (epinephrine) every three to five minutes (during alternate cycles of CPR).

- Complete two minutes of CPR before pausing again to assess rhythm and output. Whilst performing CPR consider:
  - Correcting reversible causes (4Hs and 4Ts):

#### 4Hs:

- Hypoxia (give oxygen).
- Hypovolaemia (correct with IV fluids).
- Hypothermia (especially consider in cases of drowning - check with a low-reading thermometer).
- Hyperkalaemia (or hypokalaemia, hypocalcaemia, acidaemia, or other metabolic disorder). ECG may be characteristic of hyperkalaemia. Give IV calcium chloride for hyperkalaemia, hypocalcaemia and calcium-channel blocking drug overdose.

#### 4Ts:

- Tension pneumothorax (consider if trauma or previous attempts to insert a central venous catheter).
  - Tamponade (cardiac) - particularly in cases of trauma.
  - Toxins.
  - Thromboembolism (coronary or pulmonary) - consider thrombolytic drugs but these may take up to 90 minutes to work.
- Check electrode position and contacts.
  - Attempt or verify adequate IV access, airway and oxygenation.
  - Give uninterrupted compressions once the airway is secure.

Further considerations: further amiodarone, calcium, magnesium, bicarbonate:

- Amiodarone – a further dose of 150 mg may be given for recurrent or refractory VF/VT, followed by an infusion of 900 mg over 24 hours. Use lidocaine if amiodarone is not available.
- Consider calcium (10 ml 10% calcium chloride) in cases of PEA where there has been hyperkalaemia, hypocalcaemia, overdose of calcium-channel blockers or magnesium (eg, during treatment of pre-eclampsia).
- Consider magnesium sulphate 8 mmol (4 ml of a 50% solution) for refractory VF/VT if hypomagnesaemia is suspected (potassium-losing diuretics, torsades de pointes, digoxin toxicity).
- Bicarbonate – not given routinely; only consider bicarbonate (50 mmol) in arrests associated with hyperkalaemia or tricyclic antidepressant overdose. May be repeated depending on blood gas results.

## Further care

- Transfer to hospital/ITU, for monitoring of breathing, circulation and mechanical ventilation as appropriate. Aim for an oxygen saturation of 94–98%.
- Consider need for sedation and for therapeutic hypothermia for unconscious patients, particularly those who are resuscitated following a cardiac arrest outside hospital.
- Consider when **not** to resuscitate may be a valid decision:<sup>[2]</sup>
- If a patient's condition is such that resuscitation is unlikely to succeed.
- If a mentally competent patient has consistently stated or recorded the fact that he or she does not want to be resuscitated.
- If the patient has signed an advance directive forbidding resuscitation.
- If resuscitation is not in a patient's interest as it would lead to a poor quality of life (often a great imponderable!).
- Ideally, involve patients and relatives in the decision before the emergency. When in doubt, resuscitate.

# References

1. [2021 Adult advanced life support Guidelines](#); Resuscitation Council UK
2. [Do Not Attempt CPR \(DNACPR\)](#); Resuscitation Council (UK)

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