Resuscitation Council UK

Adult advanced life support Guidelines

Authors
Jasmeet Soar
Joyce Yeung
Keith Couper
Charles Deakin
Joe DeBono
Jerry Nolan
Carmel Oliver
Helen Pocock
Emmeline Venn
Victoria Wragg
Adam Benson Clarke
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References

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Key points

- There are no major changes in these 2025 Adult Advanced Life Support (ALS) Guidelines since the previous ALS guidelines in 2021.
- Advanced Life Support interventions work best when started early.

- High-quality chest compressions with minimal interruption and early defibrillation remain priorities.
- Providing effective oxygenation and ventilation breaths are important during advanced life support and have a greater emphasis in these guidelines.
- Ensuring a correct initial defibrillator pad placement has a greater emphasis; the lateral (apical) pad should be placed below the armpit in the mid-axillary line.
- Identify and treat reversible causes of cardiac arrest without delay.
- When adrenaline is used, it should be given as soon as possible when the cardiac arrest rhythm is non-shockable, and after three defibrillation attempts for a shockable cardiac arrest rhythm.
- Patients with both in- and out-of-hospital cardiac arrest often have premonitory signs, and many of these arrests may be preventable.

Guidelines

Prevention of in-hospital cardiac arrest

- Shared decision making and advanced care planning, which integrates resuscitation decisions with emergency care treatment plans to increase clarity of treatment goals and also prevent inadvertent deprivation of other indicated treatments, besides CPR. These plans should be recorded in a consistent manner.
- Hospitals should use a track and trigger early warning score system for the early identification of patients who are critically ill or at risk of clinical deterioration.
- Hospitals should train staff in the recognition, monitoring and immediate care of the acutely ill patient.
- Hospitals should empower all staff to call for help when they identify a patient at risk of physiological deterioration. This includes calls based on clinical concern, rather than solely on vital signs.
- Hospitals should, where feasible, have systems that allow patients, families and carers to request an urgent clinical review if they are worried that the patient's condition is deteriorating (e.g. Martha's rule in England).
- Hospitals have a clear policy for the clinical response to abnormal vital signs and critical illness. This may include a critical care outreach service and/or emergency team (e.g. medical emergency team, rapid response team).

- Hospital staff should use structured communication tools to ensure effective handover of information.
- Patients should receive care in a clinical area that has the appropriate staffing, skills, and facilities for their severity of illness.
- Hospitals should review cardiac arrest events to identify opportunities for system improvement and share key learning points with hospital staff.
- Participation in a national cardiac arrest audit as a benchmark for local performance.

Prevention of out-of-hospital cardiac arrest

- Coronary heart disease (CHD) is the leading cause of sudden cardiac death (SCD), responsible for 80% of cases, particularly in older patients. Non-ischaemic cardiomyopathies contribute to 10-15% of SCD cases. In younger individuals, the main causes of SCD include inherited heart diseases, congenital heart defects, myocarditis, and substance misuse. In these patient groups, risk stratification is possible, and preventive treatments may be effective.
- Predicting SCD is challenging because most cases happen in individuals with undiagnosed heart disease. As a result, detecting early warning signs, implementing an efficient ambulance service system, and focusing on the prevention of cardiovascular disease (CVD) risk factors are crucial in the general population.
- Symptoms such as chest pain, syncope (especially during exercise, while sitting or supine), palpitations, dizziness or sudden shortness of breath that are consistent with cardiac ischaemia or an arrhythmia should be investigated.
- Overtly healthy young adults who have SCD can also have preceding signs and symptoms (e.g. syncope/pre-syncope, chest pain and palpitations) that should alert healthcare professionals to seek expert help to prevent cardiac arrest.
- Young adults presenting with characteristic symptoms of arrhythmic syncope should have a specialist cardiology assessment, which should include an electrocardiogram (ECG) and, in most cases, echocardiography, 24-hour ECG monitoring and an exercise test.
- Systematic evaluation in a clinic specialising in the care of those at risk for SCD is recommended for family members of young victims of SCD or those with a known cardiac disorder resulting in an increased risk of SCD.

- Identification of individuals with inherited conditions and screening of family members can help prevent deaths in young people with inherited heart disorders.
- Follow current national or international (e.g. European Society of Cardiology) guidelines for the diagnosis and management of syncope and arrhythmias.

Treatment of in-hospital cardiac arrest (IHCA)

- Start ALS as early as possible.
- Hospital systems should aim to recognise cardiac arrest, start CPR immediately, defibrillate rapidly (<3 min) for shockable rhythms, give adrenaline rapidly for non-shockable rhythms, and identify and treat reversible causes.
- All hospital staff should be able to recognise cardiac arrest rapidly, call for help, start CPR and defibrillate (attach an AED and follow the AED prompts, or use a manual defibrillator).
- Hospitals should adopt a standard ‘Cardiac Arrest Call’ telephone number (2222).
- Hospitals should have a resuscitation team that immediately responds to IHCAs.
- The hospital resuscitation team should include team members who have completed an accredited adult ALS course that incorporates teamwork and leadership training (e.g. RCUK ALS provider course).
- Resuscitation team members should have the key skills and knowledge to manage a cardiac arrest, including manual defibrillation, advanced airway management, intravenous access, intraosseous access, and identification and treatment of reversible causes.
- The resuscitation team should meet at the beginning of each shift for introductions and allocation of team roles.
- Hospitals should standardise resuscitation equipment.
- Termination of resuscitation rules (TOR) should not be used as a sole strategy for terminating an in-hospital resuscitation attempt.

Treatment of out-of-hospital cardiac arrest (OHCA)

- Start ALS as early as possible; ambulance service systems should be organised to provide a rapid ALS response with sufficient qualified personnel. This may include a pre-hospital critical care team.

- Adults with non-traumatic OHCA should be considered for transport to a cardiac arrest centre according to local protocols, and take into account which interventions can be provided on scene.
- Ambulance service systems should consider implementing validated criteria for the withholding and termination of resuscitation (TOR), taking into consideration specific local legal, organisational and cultural context.
- Ambulance service systems should monitor staff exposure to resuscitation, and low exposure should be addressed to increase the ambulance service team's experience in resuscitation.

Debriefing

Use data-driven, performance-focused debriefing of rescuers to improve CPR quality and patient outcomes.

CPR-induced consciousness

- Cardiopulmonary resuscitation-induced consciousness (without ROSC) is uncommon but increasingly reported. Rescuers may consider using sedative or analgesic drugs (or both) in small doses to prevent pain and distress to patients who are conscious during CPR.
- Neuromuscular blocking drugs alone should not be given to conscious patients.
- The optimal drug regimen for sedation and analgesia during CPR is uncertain. Regimens may be based on those used in critically ill patients and according to local protocols, such as small doses of fentanyl, ketamine and/or midazolam.

Defibrillation

Automated External Defibrillation (AED) versus manual defibrillation during ALS

- Manual defibrillators should only be used by rescuers who can quickly and accurately identify a cardiac arrest rhythm (within 5 s) and, if needed, deliver a safe shock with minimal interruption (aim for less than 5 s) to chest

compressions.
- Advanced Life Support providers must be proficient in using both an AED and a manual defibrillator.
- If an AED is already in use when ALS providers arrive, they should follow its shock prompts. When possible, they should transition to a manual defibrillator during a 2-minute CPR cycle.

Defibrillation strategy

- Continue CPR while a defibrillator is retrieved and pads applied. High-quality CPR improves the chances of successful defibrillation.
- Give a shock as early as possible when appropriate.
- Deliver shocks with minimal interruption to chest compressions and minimise the pre-shock and post-shock pause. This is achieved by continuing chest compressions during defibrillator charging, delivering defibrillation, aiming for an interruption in chest compressions of less than 5 s and then immediately resuming chest compressions.
- Immediate defibrillation of ventricular fibrillation (VF) of any amplitude (even fine VF) should be attempted.
- Immediately resume chest compressions after shock delivery. If there is a combination of clinical and physiological signs of return of spontaneous circulation (ROSC) such as return of consciousness, purposeful movement, a pulsatile arterial blood pressure waveform or a sharp rise in ETCO2, consider stopping chest compressions for rhythm analysis, and if appropriate, a pulse check.
- When using a defibrillator that displays the ECG with the motion artefact caused by chest compressions removed, the underlying cardiac arrest rhythm may guide the decision to perform a rhythm and pulse check every two minutes. If asystole is displayed, there would be no need to pause chest compressions for a rhythm check.

Safe and effective defibrillation

- Minimise the risk of fire by taking off any oxygen mask, e.g. nasal cannulae or bag-valve mask and by placing them at least 1 m away from the patient’s chest. When using a mechanical ventilator, oxygen exhaust from ventilation circuits should be directed away from the chest. A self-inflating bag or the ventilator circuit should remain attached to a supraglottic airway or tracheal tube.
- Charging the defibrillator in anticipation of each rhythm check may minimise hands-off time prior to shock delivery and is an acceptable alternative

strategy if delivered without prolonging the peri-shock pause.
- A shock with a manual defibrillator can be safely delivered without interrupting mechanical chest compression.
- Do not defibrillate during manual chest compressions (even when wearing clinical gloves), as that practice is not safe to the rescuer.

Defibrillation pads

- Antero-lateral pad position is the position of choice for initial pad placement. In particular, ensure that the lateral (apical) pad is positioned correctly (i.e. directly below the armpit in the mid-axillary line).
- Consider an antero-posterior pad position for vector change defibrillation following three failed shocks in cases of refractory shockable rhythms. The anterior pad is placed to the left of the sternum, avoiding as much breast tissue as possible. The posterior pad is placed at the same height, centred just medial to the left scapula.
- In patients with an implantable pacemaker/defibrillator (ICD), place the pad more than 8 cm away from the device, or use an alternative pad position.
- Consider an alternative pad position when the patient is in the prone position (e.g. bi-axillary).

Energy levels and number of shocks

- Use single shocks followed by a 2-minute cycle of chest compressions.
- The use of up to three stacked shocks may be considered only if initial ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) occurs during a witnessed, monitored cardiac arrest with a defibrillator immediately available, e.g. during cardiac catheterisation or in a highly monitored setting. For the purposes of adrenaline and amiodarone administration, the initial stacked shocks should be counted as the first shock in the ALS algorithm.
- Energy levels:
    - For biphasic waveforms (rectilinear biphasic or truncated exponential biphasic, but not pulsed biphasic), defibrillation shock energy levels for the first shock should be at least 150 J.
    - For pulsed biphasic waveforms, deliver the first shock at 130-150 J.
- If the first shock is not successful and the defibrillator is capable of delivering shocks of higher energy, it is reasonable to increase the energy for subsequent shocks.

- If the rescuer is unaware of the recommended energy settings of the defibrillator, for an adult, use the highest energy setting for all shocks.
- Use standard energy levels in obese patients.

Refractory ventricular fibrillation

- Consider escalating the shock energy after a failed shock.
- For refractory VF (defined as continuous VF after three consecutive shocks) and having ensured correct antero-lateral pad positioning, consider using a defibrillation vector change by using an alternative defibrillation pad position (e.g. antero-posterior). After a failed third shock, prepare to place a fresh set of pads in the anterior-posterior position at the time of the following rhythm check. Further optimise transthoracic impedance by shaving the anticipated areas of pad placement (if necessary).
- Dual (double) sequential defibrillation (DSD) involves using a combination of antero-lateral and antero-posterior pad positioning to discharge two shocks in close succession and has been advocated for use in refractory shockable rhythms. Given the practical challenges of using two defibrillators to deliver DSD and the limited evidence for its efficacy, the RCUK does not recommend its routine use.

Ventricular fibrillation waveform analysis for optimising shock success

- Rescuers should give defibrillation shocks according to AED prompts or use a manual defibrillator for ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) according to the ALS algorithm. There is currently no role for VF waveform analysis (e.g. based on amplitude) for identifying the optimal time for defibrillation.

Patients with actively discharging implantable cardioverter defibrillators

- Rescuers may sense a significant shock across their arms if a shock is delivered by an ICD while they are performing external chest compressions, even when wearing clinical gloves.
- If an ICD fails to terminate a shockable rhythm, conventional external shocks should be delivered, placing any defibrillation pad more than 8 cm from the defibrillator box.
- If the ICD is incorrectly detecting arrhythmias and shocking inappropriately, a magnet placed over the ICD can temporarily stop shocks but will not

disable pacing (if programmed).

Airway and ventilation

- During CPR, start with basic airway techniques and progress stepwise according to the skills of the rescuer until effective ventilation is achieved.
- Give the highest feasible inspired oxygen during CPR.
- Start effective ventilation breaths as soon as possible, ensuring the rate and tidal volume are appropriate to prevent both inadequate ventilation (hypoventilation) and excessive ventilation (hyperventilation).
- Deliver effective bag-mask ventilation breaths by optimising mask seal and airway patency, and if necessary, use a two-person technique for bag-mask ventilation.
- Give each inspiratory breath over 1 s to achieve a visible chest rise.
- When using a supraglottic airway (SGA), an i-gel is preferred to a laryngeal tube.
- Tracheal intubation should only be attempted by rescuers with a high success rate and with the use of continuous waveform capnography. The expert consensus is that a high tracheal intubation success rate is over 95% within two attempts at intubation.
- Aim for less than a 5 s interruption in chest compression for tracheal intubation.
- Use direct or video laryngoscopy for tracheal intubation according to local protocols and rescuer experience. In settings where videolaryngoscopy is immediately available, it is preferable to use videolaryngoscopy instead of direct laryngoscopy.
- A sustained $ETCO_2$ trace on waveform capnography must be used to exclude oesophageal placement of the tracheal tube.
- Once a tracheal tube or an SGA has been inserted, ventilate the lungs at a rate of 10 min^{-1} and continue chest compressions without pausing during ventilations. With an SGA, if gas leakage results in inadequate ventilation, pause compressions for ventilation using a compression-ventilation ratio of 30:2.
- If using mechanical ventilation, use a volume-controlled mode during chest compressions and set the ventilator to a tidal volume of 6-8 mL kg^{-1} (predicted ideal body weight), or to achieve a visible chest rise, the maximum inspired oxygen, a respiratory rate of 10 min^{-1}, an inspiratory time of 1–2 s, a positive end expiratory pressure (PEEP) 0-5 cm H_2O, the peak pressure alarm at 60-70 cm H_2O, and the flow trigger off. Ensure

mechanical ventilation is effective, and if not, use manual ventilation.
- If standard airway management strategies (oropharyngeal airway and bag-mask/SGA/tracheal tube) fail during cardiac arrest, appropriately trained rescuers should attempt surgical cricothyroidotomy to enable oxygenation and ventilation.

Drugs and fluids

Vascular access

- Attempt intravenous (IV) rather than intraosseous (IO) access first, to enable drug delivery in adults in cardiac arrest.
- If IV access cannot be rapidly achieved within two attempts, it is reasonable to consider IO access as an alternative route for vascular access during adult cardiac arrest.

Vasopressor drugs

- Give adrenaline 1 mg as soon as possible for adult patients in cardiac arrest with a non-shockable rhythm.
- Give adrenaline 1 mg after the third shock for adult patients in cardiac arrest with a shockable rhythm.
- Repeat adrenaline 1 mg every 3-5 minutes whilst ALS continues.

Antiarrhythmic drugs

- Give amiodarone 300 mg IV for adult patients in cardiac arrest who are in VF/pVT after a total of three shocks have been given.
- Give a further dose of amiodarone 150 mg IV for adult patients in cardiac arrest who are in VF/pVT after a total of five shocks have been given.
- Give the first dose of amiodarone after three shocks, and the second dose after five shocks, irrespective of whether the shockable rhythms are sequential (refractory VF/pVT) or intermittent (recurrent VF/pVT).
- Lidocaine 100 mg IV may be used as an alternative if amiodarone is not available or a local decision has been made to use lidocaine instead of amiodarone. An additional bolus of lidocaine 50 mg can also be given after five defibrillation attempts.

Thrombolytic drugs

- Consider immediate thrombolytic drug therapy when pulmonary embolism is the suspected or confirmed cause of cardiac arrest.
- In select patients with suspected pulmonary embolism, consider CPR for 60-90 min after administration of thrombolytic drugs.

Fluids

- Give fluids during CPR only if cardiac arrest is caused by hypovolaemia.
- Use either isotonic saline or balanced crystalloids for fluid infusion during CPR.

Other drugs

- Do not routinely give calcium, sodium bicarbonate or corticosteroids during cardiac arrest.

ALS in highly-monitored cardiac arrest, and physiology-guided CPR

- A sudden decrease in $ETCO_2$ may indicate a cardiac arrest or a very low cardiac output state.
- Consider starting chest compressions if the systolic blood pressure decreases and remains < 50 mmHg despite interventions.
- In adults undergoing continuous intra-arterial blood pressure monitoring, we suggest that adrenaline is initially given in small increments (e.g. 50-100 micrograms IV) rather than a 1 mg bolus. If a total of 1 mg has been given with no response, ensure that there is no extravasation and consider giving further IV adrenaline doses of 1 mg every 3-5 min.
- A pragmatic approach during physiology-guided CPR is to aim for a diastolic blood pressure of ≥ 30 mmHg (when using intra-arterial blood pressure monitoring) and an $ETCO_2$ ≥ 3.3 kPa (25 mmHg).

Waveform capnography during advanced life support

- Use waveform capnography to confirm correct tracheal tube placement during CPR.
- Use waveform capnography to monitor the quality of CPR.
- An increase in $ETCO_2$ during CPR may indicate that ROSC has occurred. However, chest compression should not be interrupted based on this sign

alone. Use a combination of clinical and physiological signs of ROSC (e.g. consciousness, purposeful movement, arterial waveform, rise in $ETCO_2$) before stopping chest compressions for rhythm analysis, and if appropriate, a pulse check.
- Do not use a low $ETCO_2$ value alone to decide if a resuscitation attempt should be stopped.

Use of ultrasound imaging during advanced life support

- Only skilled operators should use intra-arrest point-of-care ultrasound (POCUS).
- POCUS must not cause additional or prolonged interruptions in chest compressions.
- POCUS may help identify treatable causes of cardiac arrest, such as cardiac tamponade and tension pneumothorax.
- Right ventricular dilation in isolation during cardiac arrest should not be used to diagnose pulmonary embolism.
- Do not use POCUS for assessing contractility of the myocardium as a sole indicator for terminating CPR.

Devices

Mechanical chest compression devices

- Consider mechanical chest compressions only if high-quality manual chest compression is not practical or compromises provider safety.
- When a mechanical chest compression device is used, minimise interruptions to chest compression during device application by using only trained teams familiar with the device.

Resuscitative endovascular balloon occlusion of the aorta (REBOA)

- We do not recommend the routine use of REBOA for cardiac arrest unless being evaluated in a clinical trial.

Intra-arrest cooling

- We do not recommend intra-arrest cooling during advanced life support (unless there is severe hyperthermia).

Extracorporeal CPR

- Extracorporeal CPR (ECPR) may be considered as a rescue therapy for selected adults with IHCA and OHCA when conventional CPR is failing to restore spontaneous circulation, in settings in which this can be implemented.

Peri-arrest arrhythmias

- The 2025 ALS guidelines and algorithms focus on those arrhythmias that require immediate treatment before or after cardiac arrest.
- Rescuers should seek expert advice if the arrhythmia and/or life-threatening features persist.
- The assessment and treatment of all arrhythmias address the condition of the patient (stable versus unstable) and the nature of the arrhythmia. Persistent arrhythmias require careful evaluation, as they are often linked to underlying structural heart disease and may indicate unresolved issues such as myocardial ischaemia. In addition to an arrhythmia occurring immediately after ROSC, life-threatening features in an unstable patient include:
    - **Shock** – recognised by hypotension (e.g. systolic blood pressure < 90 mmHg) along with signs of compensatory mechanisms, such as increased sympathetic activity, and evidence of inadequate organ perfusion
    - **Syncope** – as a consequence of reduced cerebral blood flow.
    - **Heart failure** – manifested by pulmonary oedema (failure of the left ventricle) and/or raised jugular venous pressure (failure of the right ventricle).
    - **Myocardial ischaemia** – may present with chest pain (angina) or may occur without pain as an isolated finding on the 12-lead ECG (silent ischaemia).

Tachyarrhythmias

- Electrical cardioversion is the preferred treatment for tachyarrhythmia in the unstable patient displaying potentially life-threatening adverse signs or immediately after ROSC.

- Electrical cardioversion is recommended for stable patients with monomorphic VT who have structural heart disease or when it is unclear whether there is underlying heart muscle damage.
- Conscious patients require careful anaesthesia or sedation before attempting synchronised cardioversion; be aware of the risk of haemodynamic deterioration with anaesthesia/sedation.
- When cardioverting atrial or ventricular tachyarrhythmias, the shock must be synchronised to occur with the R wave of the ECG.
- For atrial fibrillation:
    - An initial synchronised shock at maximum defibrillator output, rather than an escalating approach, is a reasonable strategy based on current data.
- For atrial flutter and paroxysmal supraventricular tachycardia:
    - Give an initial shock of 70-120 J.
    - Give subsequent shocks using stepwise increases in energy.
- For ventricular tachycardia with a pulse:
    - Use energy levels of 120-150 J for the initial shock.
    - Consider stepwise increases in energy if the first shock fails to achieve sinus rhythm.
- If cardioversion fails to restore sinus rhythm and the patient remains unstable, give procainamide 10–15 mg kg^{-1} (maximum 1 g) over 20 min or amiodarone 300 mg intravenously over 10–20 min according to local availability and protocols, and re-attempt electrical cardioversion. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 h.
- Pharmacological treatment may be considered in haemodynamically stable patients with monomorphic ventricular tachycardia if there is an increased risk with sedation or anaesthesia.
- Consider digoxin or amiodarone for acute heart rate control in patients with AF and haemodynamic instability and severely reduced left ventricular ejection fraction (LVEF). For stable patients with LVEF < 40% consider digoxin or a beta-blocker to achieve a heart rate less than 110 min^{-1}.

Bradycardia

- If bradycardia is accompanied by adverse signs, give atropine 500 micrograms IV and, if necessary, repeat every 3–5 min to a total of 3 mg.
- If treatment with atropine is ineffective, consider second-line drugs. These include isoprenaline (5 micrograms min^{-1} starting dose), and adrenaline (2–10 micrograms min^{-1}).

- For bradycardia in patients with cardiac transplant or spinal cord injury, consider giving aminophylline (100–200 mg slow intravenous injection). Do not give atropine to patients with cardiac transplants; it can cause a high-degree atrioventricular block or even sinus arrest; use aminophylline.
- Consider giving glucagon if beta-blockers or calcium channel blockers are a potential cause of the bradycardia.
- Do not give atropine to patients with high-degree atrioventricular block and wide QRS. It is ineffective and may worsen the block.
- Consider pacing in unstable patients with symptomatic bradycardia refractory to drug therapies:
    - Establish early transvenous pacing in unstable patients with symptomatic bradycardia.
    - Consider transthoracic (transcutaneous) pacing as a bridge to transvenous pacing or when transvenous pacing is not readily available.
- Whenever a diagnosis of asystole is made, check the ECG carefully for the presence of P waves because, unlike true asystole, this is more likely to respond to cardiac pacing.
- If atropine is ineffective and transvenous/transcutaneous pacing is not immediately available, fist pacing can be attempted while waiting for pacing equipment.

Downloads

Adult ALS algorithm 2025 39.31 KB

Adult in hospital algorithm 2025 37 KB

Adult tachyarrhythmia algorithm V2 January 2026 46.07 KB

Adult bradyarrhythmia 2025 37.32 KB