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# Emergency Medicine

## Advanced Life Support



Give a shock as early as possible when appropriate. Consider amiodarone for acute heart rate control in AF patients with haemodynamic instability and severely reduced left ventricular ejection fraction (LVEF). For ventricular tachycardia with a pulse: Use energy levels of 120-150 J for the initial shock. Those with a particular interest in resuscitation should then consider attending an ALS provider course, where appropriate. Lidocaine 100 mg IV (IO) may be used as an alternative if amiodarone is not available or a local decision has been made to use lidocaine instead of amiodarone. For refractory VF, consider using an alternative defibrillation pad position (e.g. anterior-posterior). 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. Consider giving glucagon if beta-blockers or calcium channel blockers are a potential cause of the bradycardia. Hospital staff should use structured communication tools to ensure effective handover of information. Consider stepwise increases if the first shock fails to achieve sinus rhythm. Systematic evaluation in a clinic specialising in the care of those at risk for SCD is recommended in family members of young victims of SCD or those with a known cardiac disorder resulting in an increased risk of SCD. For atrial fibrillation: An initial synchronised shock at maximum defibrillator output rather than an escalating approach is a reasonable strategy based on current data. Give a further dose of amiodarone 150 mg IV (IO) for adult patients in cardiac arrest who are in VF/pVT after five shocks have been administered. Add digoxin if necessary. Tachycardias Electrical cardioversion is the preferred treatment for tachyarrhythmia in the unstable patient displaying potentially life-threatening adverse signs. The process used to produce the Resuscitation Council UK Guidelines 2021 is accredited by the National Institute for Health and Care Excellence (NICE). The guidelines process includes: systematic reviews with grading of the certainty of evidence and strength of recommendations. Mechanical chest compression devices Consider mechanical chest compressions only if high-quality manual chest compression is not practical or compromises provider safety. These plans should be recorded in a consistent manner (See Ethics section). Recurrent or refractory VF Consider escalating the shock energy, after a failed shock and for patients where defibrillation occurs. Hospital systems should aim to recognise cardiac arrest, start CPR immediately, and defibrillate rapidly (8 cm away from the device, or use an alternative pad position). Thrombolytic drugs Consider thrombolytic drug therapy when pulmonary embolus is suspected or confirmed as the cause of cardiac arrest. Identification of individuals with inherited conditions and screening of family members can help prevent deaths in young people with inherited heart disorders. Hospitals should train staff in the recognition, monitoring and immediate care of the acutely ill patient. Defibrillation strategy Continue CPR while a defibrillator is retrieved, and pads applied. If transcutaneous pacing is ineffective, consider transvenous pacing. Apparently healthy young adults who suffer sudden cardiac death (SCD) can also have 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. Candidates reaching the required standard receive an ALS provider certificate. Drugs and fluids Vascular access Attempt intravenous (IV) access first to enable drug delivery in adults in cardiac arrest. If treatment with atropine is ineffective, consider second line drugs. Consider pacing in patients who are unstable, with symptomatic bradycardia refractory to drug therapies. Adult patients with a cardiac arrest of presumed primary cardiac aetiology should be transported directly to a hospital with 24/7 coronary angiography capability. These guidelines have followed European and international guidelines for the treatment of peri-arrest arrhythmias. They are approved and certified by the European Resuscitation Council. Life-threatening features in an unstable patient include: shock - appreciated as hypotension (e.g. systolic blood pressure < 90 mmHg) and symptoms of increased sympathetic activity and reduced cerebral blood flow syncope - as a consequence of reduced cerebral blood flow severe 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). Deliver shocks with minimal interruption to chest compression and minimise the pre-shock and post-shock pause. A range of defibrillation energy levels have been recommended by manufacturers and previous guidelines, ranging from 120-360 J. For bradycardia caused by inferior myocardial infarction, cardiac transplant or spinal cord injury, consider giving aminophylline (100-200 mg slow intravenous injection). POCUS must not cause additional or prolonged interruptions in chest compressions. Do not give atropine to patients with cardiac transplants - it can cause a high-degree AV block or even sinus arrest - use aminophylline. Bradycardia If bradycardia is accompanied by life-threatening adverse signs, give atropine 500 mcg IV (IO) and, if necessary, repeat every 3-5 minutes to a total of 3 mg. The loading dose of amiodarone can be followed by an infusion of 900 mg over 24 hours. Immediately resume chest compressions after shock delivery. An additional bolus of lidocaine 50 mg can also be given after five defibrillation attempts. All hospital staff should be able to rapidly recognise cardiac arrest, call for help, start CPR and defibrillate (attach an AED and follow the AED prompts, or use a manual defibrillator). Hospitals should standardise resuscitation equipment. POCUS may be useful to diagnose treatable causes of cardiac arrest such as cardiac tamponade and pneumothorax. Management of cardiac arrest in patients with known or suspected COVID-19 is not specifically included in these guidelines, but is covered within the separate COVID-19 guidance which is accessible from the RCUK website. Symptoms such as syncope (especially during exercise, while sitting or supine), palpitations, dizziness and sudden shortness of breath that are consistent with an arrhythmia should be investigated. Give subsequent shocks using stepwise increases in energy. Use of ultrasound imaging during advanced life support Only skilled operators should use intra-arrest point-of-care ultrasound (POCUS). The ALS course aims to train candidates to identify the causes of cardiac arrest, recognise patients in danger of deterioration, and manage both the cardiac arrest and the 'peri-arrest' problems encountered in the first hour or so after initial resuscitation from a cardiac arrest. For atrial flutter and paroxysmal supraventricular tachycardia: Give an initial shock of 70 - 120 J. A shock can be safely delivered without interrupting mechanical chest compression. Hospitals should review cardiac arrest events to identify opportunities for system improvement and share key learning points with hospital staff. If cardioversion fails to restore sinus rhythm and the patient remains unstable, give amiodarone 300 mg intravenously over 10-20 minutes (or procainamide 10-15 mg kg<sup>-1</sup> over 20 minutes) and re-attempt electrical cardioversion. Follow current European Society of Cardiology (ESC) guidelines for the diagnosis and management of syncope. 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. Extracorporeal CPR Consider extracorporeal CPR (eCPR) as a rescue therapy for selected patients with cardiac arrest when conventional ALS measures are failing and to facilitate specific interventions (e.g. coronary angiography and percutaneous coronary intervention (PCI), pulmonary thrombectomy for massive pulmonary embolism, rewarming after hypothermic cardiac arrest) in settings in which it can be implemented. Adult patients with non-traumatic OHCA should be considered for transport to a recognised centre of care for appropriate specialist treatment, according to local protocols. Debriefing Use data-driven, performance-focused debriefing of rescuers to improve CPR quality and patient outcomes. Consider intraosseous (IO) access if attempts at IV access are unsuccessful or IV access is not feasible. The hospital resuscitation team should include team members who have completed an accredited RCUK adult ALS course. 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. There is no evidence to express a preference for a policy of primarily transporting via ambulance (using bypass protocols) or one of secondary inter-hospital transfer. The guidelines recognise the increasing role of point-of-care ultrasound (POCUS) in peri-arrest care for diagnosis, but emphasises that it requires a skilled operator, and the need to minimise interruptions during chest compression. It is a standardised European course teaching evidence-based resuscitation guidelines and skills to healthcare professionals. Give each breath over 1 second to achieve a visible chest rise. The ALS course provides a standardised approach to cardiopulmonary resuscitation in adults. Use waveform capnography to confirm tracheal tube position. Do not use POCUS for assessing contractility of the myocardium as a sole indicator for terminating CPR. Ensure that the apical (lateral) pad is positioned correctly (mid-axillary line, level with the V6 ECG electrode position) i.e. below the armpit. Conscious patients require anaesthesia or sedation, before attempting synchronised cardioversion. Also consider an alternate pad position when the patient is in the prone position (bi-axillary), or in a refractory shockable rhythm (see below). However, chest compression should not be interrupted based on this sign alone. To convert atrial or ventricular tachyarrhythmias, the shock must be synchronised to occur with the P waves of the electrocardiogram (ECG). The resuscitation team should meet at the beginning of each shift for introduction and allocation of team roles.



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