INTRODUCTION

The heart rhythms associated with cardiac arrest are divided into two groups:

1. **shockable rhythms** – ventricular fibrillation and pulseless ventricular tachycardia (VF/VT)
2. **non-shockable rhythms** – asystole and pulseless electrical activity (PEA).

The principal difference in the management of these two groups is the need for attempted defibrillation in VF/VT. Subsequent actions including chest compressions, airway management and ventilation, venous access, administration of adrenaline and the management of reversible factors, are common to both groups.

Undue time should not be spent trying to establish intravenous access, and interruptions to chest compressions while attempting this must be kept to a minimum. Paramedics should not regard the administration of drugs as a priority in the management of cardiac arrest, and should not incur criticism if none are given during a resuscitation attempt.

The interventions that unequivocally improve survival are early defibrillation and effective basic life support. Attention should focus therefore on early defibrillation and high quality, uninterrupted cardio-pulmonary resuscitation (CPR).

The value of drugs in the management of cardiac arrest is debatable. Establishing intravenous access for their administration is often difficult in the pre-hospital arena, particularly in patients with cardiac arrest. Increasing evidence testifies to the value of CPR in this situation, and particularly chest compressions.

Sequence of Actions – The Adult ALS Algorithm (see Appendix 1)

Having confirmed cardiac arrest, summon help if appropriate.

Start CPR beginning with chest compressions. Ventilate with high concentration oxygen.

Personnel working outside hospital should perform CPR for two minutes (about 5 cycles of 30:2) before attempting defibrillation unless the arrest is witnessed by healthcare professionals and a defibrillator is immediately available.

As soon as the defibrillator arrives, diagnose the rhythm by applying paddles or self adhesive pads to the chest.

1. SHOCKABLE RHYTHMS (VF/PULSELESS VT)

Attempt defibrillation (one shock – 150-200 Joules biphasic or 360 Joules monophasic).

Immediately resume chest compressions (30:2) without re-assessing the rhythm or feeling for a pulse.

Continue CPR for 2 minutes, and then pause briefly to check the monitor,

If VF/VT persists:

- give a further (2nd) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- pause briefly to check the monitor
- if VF/VT persists give adrenaline 1 milligram IV followed immediately by a (3rd) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- pause briefly to check the monitor
- if VF/VT persists give amiodarone 300 milligrams IV followed immediately by a (4th) shock (150-360 Joules biphasic or 360 Joules monophasic)
- resume CPR immediately and continue for 2 minutes
- give adrenaline 1 milligram IV immediately before alternate shocks (i.e. approximately every 3-5 minutes)
- give further shocks after each 2 minute period of CPR and after confirming that VF/VT persists.

If organised electrical activity is seen, check for a pulse.

- If a pulse is present, start post-resuscitation care.
- If no pulse is present, continue CPR and switch to the non-shockable algorithm.

If asystole is seen, continue CPR and switch to the non-shockable algorithm.

2. NON-SHOCKABLE RHYTHMS (ASYSTOLE AND PEA)

If these rhythms are identified, start CPR 30:2 and give adrenaline 1 milligram as soon as intravascular access is achieved.

If asystole is displayed, without stopping CPR, check the leads are attached correctly.

Give atropine 3 milligrams if the rhythm is asystole or slow PEA (<60/minute).

Secure the airway as soon as possible to enable continuous chest compressions without pausing for ventilation.

After two minutes CPR 30:2 recheck the rhythm. If asystole is present or there has been no change in ECG appearance resume CPR immediately.

If VF / VT recurs, change to the shockable rhythm algorithm.

If an organised rhythm is present, attempt to palpate a pulse.

If a pulse is present begin post resuscitation care.

If no pulse is present (or there is any doubt) continue CPR. Give adrenaline 1 milligram IV every 3–5 minutes (alternate loops).

If signs of life return during CPR, check the rhythm and attempt to palpate a pulse.

POTENTIALLY REVERSIBLE CAUSES

Potential causes or aggravating factors for which specific treatment exists must be considered during any cardiac arrest. For ease of memory these are presented as the 4H's and 4T's according to their initial letter.

Those amenable to treatment include:

4 H's

1. **Hypoxia** – ensure adequate ventilation, adequate chest expansion and breath sounds. Verify tracheal tube placement.
2. **Hypovolaemia –** PEA caused by hypovolaemia is usually due to haemorrhage from trauma, gastrointestinal bleeding or rupture of an aortic aneurysm. Intravascular volume should be restored rapidly with IV fluid. Rapid transport to definitive surgical care is essential.
3. **Hypothermia –** refer to hypothermia and immersion incident guidelines.
4. **Hyperkalaemia** and other electrolyte disorders are unlikely to be apparent in the pre-hospital arena or amenable to treatment.

4T's

1. **Tension Pneumothorax –** the diagnosis is made clinically; decompress as soon as possible by needle thoracocentesis.
2. **Cardiac Tamponade** is difficult to diagnose as the typical signs (high venous pressure, hypotension) disappear after cardiac arrest occurs. Cardiac arrest after penetrating chest trauma is highly suggestive of cardiac tamponade. Pericardiocentesis or thoracotomy can be performed outside hospital by specialist teams.
3. **Toxins –** only rarely will an antidote be available outside hospital, and in most cases supportive treatment will be the priority.
4. **Thromboembolism –** massive pulmonary embolism is the commonest cause but diagnosis in the field is difficult once arrest has occurred. Specific treatments (like thrombolytic drugs) are not available to ambulance personnel in the UK at present.

THE WITNESSED, MONITORED ARREST

If a patient who is being monitored has a witnessed arrest:

- confirm cardiac arrest, summon help if appropriate
- if the rhythm is VF/VT and a defibrillator is not immediately available consider a precordial thump
- if the rhythm is VF/VT and a defibrillator is immediately available, give a shock first.

When the arrest is witnessed but unmonitored, using the paddles or adhesive electrodes will allow assessment of the rhythm more quickly than attaching ECG electrodes.

Key Points – Adult Advanced Life Support (ALS)

- Unless the arrest is witnessed by HCP and a defibrillator is immediately available, perform CPR for 2 minutes (approximately 5 cycles of 30:2) before attempting defibrillation.
- Secure airway as soon as possible to enable continuous chest compressions.
- For shockable rhythms defibrillate and resume chest compressions (30:2) without re-assessing the rhythm or feeling for a pulse for 2 minutes then check rhythm, if VT/VT persists follow ALS algorithm.
- For non-shockable rhythms start CPR at a ratio of 30:2 and give adrenaline 1mg as soon as intravascular access is achieved.
- Always consider reversible features (4Hs and 4Ts) and correct when possible.

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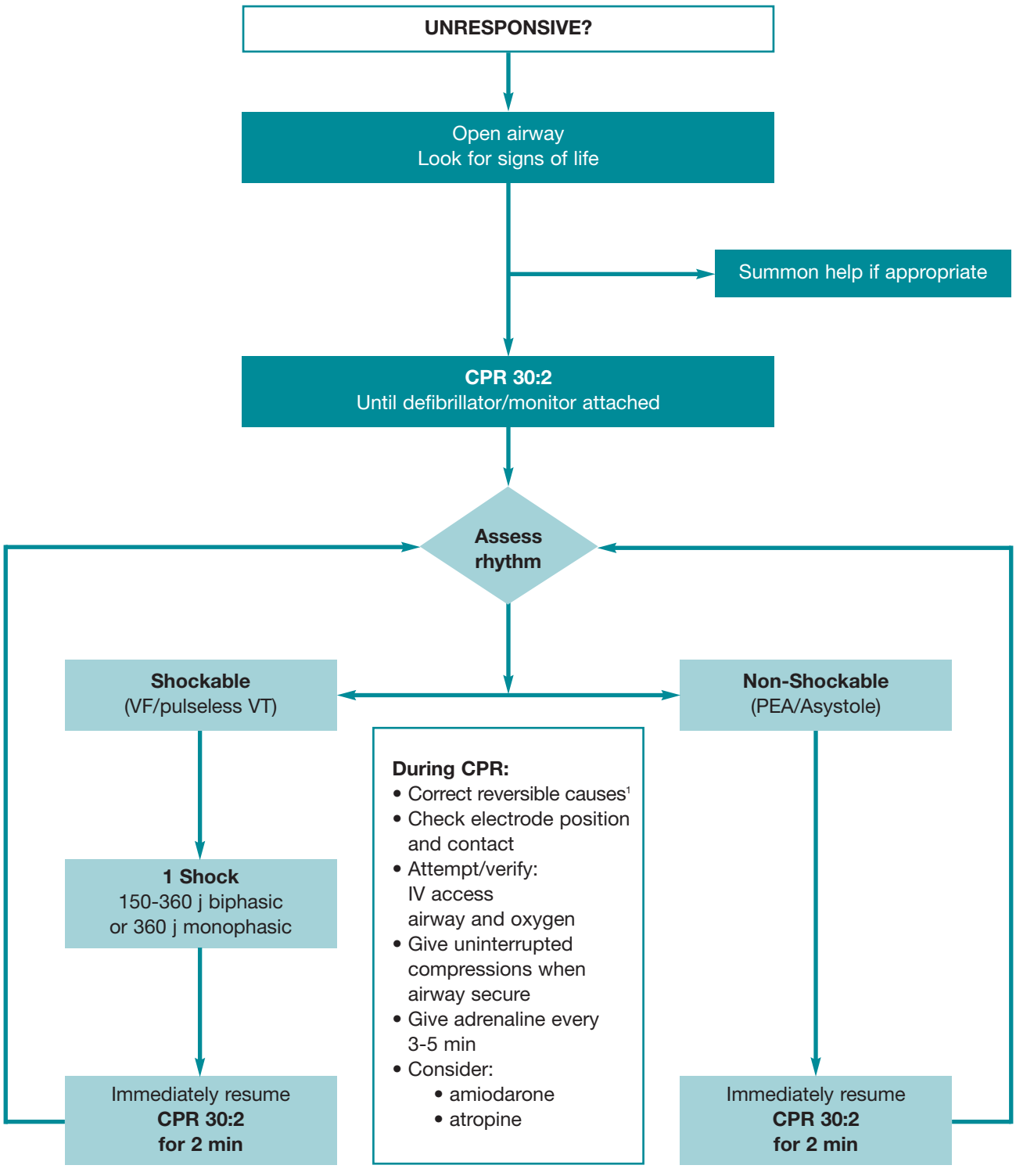
METHODOLOGY

The methodology describing the development process of the international cardio-pulmonary resuscitation treatments recommendations on which this guideline is based is fully described in the publications listed below.

Morley PT, Zaritsky A. The evidence evaluation process for the 2005 International Consensus Conference on cardio-pulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Resuscitation* 2005;67(2-3):167-170.

Zaritsky A, Morley PT. The Evidence Evaluation Process for the 2005 International Consensus Conference on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. *Circulation* 2005;112(22_suppl):III-128-130.

APPENDIX 1 – Adult Advanced Life Support Algorithm



[1]**Reversible Causes**

Hypoxia	Tension pneumothorax
Hypovolaemia	Tamponade, cardiac
Hypo/hyperkalaemia/metabolic	Toxins
Hypothermia	Thrombosis (coronary or pulmonary)