ALS Algorithm



Learning outcomes

- The ALS algorithm
- Importance of high quality chest compressions
- Treatment of shockable and non-shockable rhythms
- Administration of drugs during cardiac arrest
- Potentially reversible causes of cardiac arrest
- Role of resuscitation team





Early recognition prevents:

- Cardiac arrests and deaths
- Admissions to ICU
- Inappropriate resuscitation attempts





Adult Advanced Life Support





Unresponsive? Not breathing or only occasional gasps



To confirm cardiac arrest...

- Patient response
- Open airway
- Check for normal breathing
 - Caution agonal breathing
- Check circulation
- Monitoring





Cardiac arrest confirmed

Call resuscitation team









Chest compression



- 30:2
- Compressions
 - Centre of chest
 - 5-6 cm depth
 - 2 per second (100-120 min⁻¹)
- Maintain high quality compressions with minimal interruptions
- Continuous compressions once airway secured
- Switch CPR provider every 2 min cycle to avoid fatigue







- Bizarre irregular waveform
- No recognisable QRS complexes
- Random frequency and amplitude

- Uncoordinated electrical activity
- Coarse/fine
- Exclude artefact
 - Movement
 - Electrical interference





- Monomorphic VT
 - Broad complex rhythm
 - Rapid rate
 - Constant QRS mc

- Polymorphic VT
 - Torsade de pointes























Defibrillation energies

- Vary with manufacturer
- Check local equipment
- If unsure, deliver highest available energy
- DO NOT DELAY SHOCK
- Energy levels for defibrillators on this course...



If VF / VT persists



- 2nd and subsequent shocks
 - 150 360 J biphasic
 - 360 J monophasic
- Give adrenaline and amiodarone after 3rd shock during CPR



Treatment of shockable rhythms (VF/VT)

- Confirm cardiac arrest check for signs of life and normal breathing, and if trained to do so check for breathing and a pulse simultaneously.
- Call resuscitation team.
- Perform uninterrupted chest compressions while applying selfadhesive defibrillation/monitoring pads – one below the right clavicle and the other in the V6 position in the midaxillary line.
- Plan actions before pausing CPR for rhythm analysis and communicate these to the team.
- Stop chest compressions; confirm VF/pVT from the ECG. This pause in chest compressions should be brief and no longer than 5 seconds.
- Resume chest compressions immediately; warn all rescuers other than the individual performing the chest compressions to "stand clear" and remove any oxygen delivery device as appropriate.



Treatment of shockable rhythms (VF/VT) Continue

- The designated person selects the appropriate energy on the defibrillator and presses the charge button. Choose an energy setting of at least 150 J for the first shock, the same or a higher energy for subsequent shocks, or follow the manufacturer's guidance for the particular defibrillator. If unsure of the correct energy level for a defibrillator choose the highest available energy.
- Ensure that the rescuer giving the compressions is the only person touching the patient.
- Once the defibrillator is charged and the safety check is complete, tell the rescuer doing the chest compressions to "stand clear"; when clear, give the shock.
- After shock delivery immediately restart CPR using a ratio of 30:2, starting with chest compressions. Do not pause to reassess the rhythm or feel for a pulse. The total pause in chest compressions should be brief and no longer than 5 seconds.
- Continue CPR for 2 min; the team leader prepares the team for the next pause in CPR.
- Pause briefly to check the monitor.
- If VF/pVT, repeat steps 6–12 above and deliver a second shock.



Treatment of shockable rhythms (VF/VT) Continue

- If VF/pVT persists, repeat steps 6–8 above and deliver a third shock. Resume chest compressions immediately. Give adrenaline 1 mg IV and amiodarone 300 mg IV while performing a further 2 min CPR. Withhold adrenaline if there are signs of return of spontaneous circulation (ROSC) during CPR.
- Repeat this 2 min CPR rhythm/pulse check defibrillation sequence if VF/pVT persists.
- Give further adrenaline 1 mg IV after alternate shocks (i.e. approximately every 3–5 min).
- If organised electrical activity compatible with a cardiac output is seen during a rhythm check, seek evidence of ROSC (check for signs of life, a central pulse and end-tidal CO₂ if available).
 - If there is ROSC, start post-resuscitation care.
 - If there are no signs of ROSC, continue CPR and switch to the non-shockable algorithm.
- If asystole is seen, continue CPR and switch to the non shockable algorithm.





MINIMISE INTERRUPTIONS IN CHEST COMPRESSIONS





- Absent ventricular (QRS) activity
- Atrial activity (P waves) may persist
- Rarely a straight line trace
- Adrenaline 1 mg IV then every 3-5 min







- Clinical features of cardiac arrest
- ECG normally associated with an output
- Adrenaline 1 mg IV then every 3-5 min



Treatment of PEA and asystole

- Start CPR 30:2
- Give adrenaline 1 mg IV as soon as intravascular access is achieved
- Continue CPR 30:2 until the airway is secured then continue chest compressions without pausing during ventilation
- Recheck the rhythm after 2 min:
- a. If electrical activity compatible with a pulse is seen, check for a pulse and/or signs of life
 - i. If a pulse and/or signs of life are present, start post resuscitation care
 - ii. If no pulse and/or no signs of life are present (PEA OR asystole):
- Continue CPR
- Recheck the rhythm after 2 min and proceed accordingly
- Give further adrenaline 1 mg IV every 3–5 min (during alternate 2-min loops of CPR)
- b. If VF/pVT at rhythm check, change to shockable side of algorithm.



During CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Correct reversible causes



Airway and ventilation

- Secure airway:
 - Supraglottic airway device e.g. LMA, i-gel
 - Tracheal tube
- Do not attempt intubation unless trained and competent to do so
- Once airway secured, if possible, do not interrupt chest compressions for ventilation
- Avoid hyperventilation
- Capnography



Vascular access

- Peripheral versus central veins
- Intraosseous











Hypoxia

- Ensure patent airway
- Give high-flow supplemental oxygen
- Avoid hyperventilation





Hypovolaemia

- Seek evidence of hypovolaemia
 - History
 - Examination
 - Internal haemorrhage
 - External haemorrhage
 - Check surgical drains
- Control haemorrhage
- If hypovolaemia suspected give intravenous fluids





Hypo/hyperkalaemia and metabolic disorders

- Near patient testing for K⁺ and glucose
- Check latest laboratory results
- Hyperkalaemia
 - Calcium chloride
 - Insulin/dextrose
- Hypokalaemia/ Hypomagnesaemia
 - Electrolyte supplementation





Hypothermia

- Rare if patient is an in-patient
- Use low reading thermometer
- Treat with active rewarming techniques
- Consider cardiopulmonary bypass





Tension pneumothorax

- Check tube position if intubated
- Clinical signs
 - Decreased breath sounds
 - Hyper-resonant percussion note
 - Tracheal deviation
- Initial treatment with needle decompression or thoracostomy





Tamponade, cardiac

- Difficult to diagnose without echocardiography
- Consider if penetrating chest trauma or after cardiac surgery
- Treat with needle pericardiocentesis or resuscitative thoracotomy





Toxins

- Rare unless evidence of deliberate overdose
- Review drug chart





Thrombosis

- If high clinical probability for PE consider fibrinolytic therapy
- If fibrinolytic therapy given continue CPR for up to 60-90 min before discontinuing resuscitation





Ultrasound

- In skilled hands may identify reversible causes
- Obtain images during rhythm checks
- Do not interrupt CPR









Resuscitation team

- Roles planned in advance
- Identify team leader
- Importance of non-technical skills
 - Task management
 - Team working
 - Situational awareness
 - Decision making
- Structured communication





Any questions?



Summary

- The ALS algorithm
- Importance of high quality chest compressions
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