

Advanced Life Support

Objectives

By the end of this module you will

- Know the ALS flowchart from memory
- Know the first vital priorities when arriving at an arrest
- Know the crucial detail necessary to save lives in ALS

Reference

<http://www.Resus.org>

Flowcharts and ALS guidelines documents

Background

Successful resuscitation requires many different attributes

- *Knowledge*
- *Technical*
- The ability to work in a *team*
- And *manage your resources*.

This exercise will attempt to improve your knowledge to the level of a senior medical professional in the area of advanced cardiac life support. I believe that having exceptional knowledge in this area will assist you to greatly improve your technical skills and ability to manage a team and resources.

Task

Complete this exercise by reading the ALS documents provided and answer the questions as you read. This document will be an amazing resource during your training, as it will contain all the critical knowledge necessary to ensure effective resuscitation

THE BIG PICTURE QUESTIONS

- 1) Draw the ALS flowchart



- 2) Draw a rough sketch of the flowchart 5 more times
- 3) Imagine yourself on a general medical ward in your hospital. A nurse shouts for help from the adjacent room. To ensure you don't forget a step you realize the need to follow the DRSABC system. What does each stand for and what action can you perform for each (look at BLS flow chart)

Danger

Check for danger

Apply personal protective equipment (gloves mask, eye protection)

Response

Check for a verbal and pain response by loudly asking the patient their name and giving a firm squeeze of the trapezius muscle

Send for help

Depending where you are, this may be done by pressing an alarm, calling the medical emergency team or calling an ambulance.

Airway

Look, Listen and feel for any signs of airway obstruction

Alleviate an obstruction with a combination of positioning the patient, carefully removing obvious obstructions, using manoeuvres (jaw thrust, chin lift, head tilt) and airway adjuncts (guedel, nasopharyngeal airway)

Breathing

Look, listen and feel for the signs of breathing. You can often observe respiratory effort, hear breath sounds or feel air movement near the nose or mouth.

If the breathing is absent or abnormal... what is the very next action?

COMMENCE CPR

- 4) Now that you've commenced CPR, you have many tasks to do and only limited time to achieve them. What are the FOUR most important priorities during an arrest?
 - i. Chest compression
 - ii. Attach defibrillator pads and perform a rhythm check
 - iii. Airway management (ventilate and oxygenate using self inflating bag and mask)
 - iv. Obtain iv access and have adrenaline, amiodarone and fluid ready

NB: Knowing these you will be able to manage your time and resources to address the most important issues. Understand that you will not be able to do 1 or more of these until equipment and expertise arrives. CPR does not require any special equipment so can be commenced immediately.

5) What is the most difficult thing about commencing CPR?

Making the decision to act!

6) After which shock is adrenaline administered? What dose? When is it re-administered?

2nd shock. 1mg adrenaline. Readminister the dose every 4 minutes.

7) How many cycles of CPR 30 compressions:2 breaths occur for every 2 min period?

5 cycles

8) After which shock is amiodarone given? What dose? When is it re-administered?

3rd shock. 300mg. An additional dose of 150 mg could be considered. This may be followed by an infusion (ie: 15 mg/kg over 24 hours).

9) What are the shockable rhythms?

Ventricular fibrillation (VF) and ventricular tachycardia (pulseless VT)

10) What are the non-shockable rhythms

Asystole: remember to check your leads – most modern machines will show a dotted line if there's a disconnection. Also check the gain and check other leads to see if there is a rhythm

PEA: any rhythm that's not mentioned above can be pulseless electrical activity. Eg. If the patient is in Sinus rhythm, SVT, AF, 3 degree heart block or any other rhythm – make sure to check for a pulse.

No pulse = PEA.

11) What are the reversible causes you must consider?

**Hypovolaemia, Hypoxaemia, Hypothermia, Hypo/Hyper electrolytes
Tension pneumothorax, Tamponade, Thrombosis (cardiac or pulmonary), Toxins**

THE ESSENTIAL DETAILS

Introduction to ALS

- 1) Effective external cardiac compression provides a cardiac output of 20-30% of the pre arrest value?
- 2) What are the first 2 most important priorities in resuscitation from sudden cardiac arrest?

Effective chest compressions and early defibrillation

- 3) To prevent cardiac arrest, patients that present with characteristics symptoms of arrhythmic syncope should be managed by *specialist cardiology assessment (and include an ECG, Echo, stress test)*
- . These characteristics include *syncope in the supine position, occurring during or after exercise, with no or only brief prodromal symptoms, repetitive episodes, or in individuals with a family history of sudden cardiac death* [L][SEP]
- 4) After reading the section on pre-arrest detection and management, what system of care should hospitals provide
 - *staff education about the signs of patient deterioration,* [L][SEP]
 - *appropriate and regular vital signs monitoring of patients,* [L][SEP]
 - *clear guidance (e.g. via calling criteria or early warning scores) to assist staff in the [L][SEP]early detection of patient deterioration, [L][SEP]*
 - *a clear, uniform system of calling for assistance, and* [L][SEP]
 - *a clinical response to calls for assistance.* [L][SEP]
- 5) As a future junior doctor, what factors in your opinion will impede you calling for help for the care of an unwell patient.

CPR for ALS providers

- 1) What is the purpose of cardiopulmonary resuscitation? *To provide sufficient vital organ blood flow (eg. to brain, heart) to preserve life until the definitive procedures can be performed (eg. defibrillation, correction of underlying cause)*
- 2) Observational studies have shown these 3 issues with health care professional CPR. *Inadequate depth, excessive ventilation rates and excessive interruptions to chest compressions*

- 3) What criteria must be satisfied before commencing CPR? *If the victim is not responsive, the airway should be cleared and breathing assessed, and if the victim is not breathing normally*
- 4) What is the ratio of compressions:ventilations? *30:2*
- 5) Do you need to check for a pulse before commencing CPR? *No*
- 6) When is it appropriate to check for a pulse? and for how long? *If you are an ALS provider trained to do so, and for less than 10 seconds*
- 7) Where do you place your hands for CPR? *Lower half of sternum*
- 8) What is the depth of compression during CPR? *At least 5cm or 1/3 AP diameter*
- 9) At what rate do you perform CPR? Above which rate is there probably no benefit? *120 compressions/minute. Rates >120 showed no benefit*
- 10) What is the duty cycle and what is the optimal duty cycle? *Time in compression to time in relaxation. 50% is recommended, which is equal time in compression and release.*
- 11) What can incomplete chest recoil cause during CPR? How can this be prevented? *It can cause decreased cardiac output. Ensure the heel of the hand is lifted slightly but completely off the chest*
- 12) Is CPR more effective on a firm or soft surface? *Firm*
- 13) When is it reasonable to interrupt CPR? *CPR should be continued without interruptions unless signs of responsiveness of normal breathing return or it is necessary to stop to perform specific tasks (eg. endotracheal intubation, rhythm analysis or defibrillation). It is recommended that attempts at intubation should ideally not interrupt cardiac compressions at all. For healthcare professionals, it is reasonable to check a pulse if an organized rhythm is visible on the monitor at the next rhythm check*
- 14) When charging the defibrillator, does CPR pause? *No.*
- 15) What is the ratio of compressions to ventilations before the airway is intubated? How many ventilations per minute is this? *~5 per minute*
- 16) When the patient is intubated, what ventilation rate is required? How many ventilations per compressions is this? *6-10 per minute*
- 17) When do chest compression providers show fatigue? When do they become aware of it? *1min. 5 min*
- 18) When should the 'chest compressor' be switched? *Every 2 minutes or when fatigued*

19) Is it safe to charge the defibrillator during chest compressions? *Yes if safe protocols are followed*

20) During which cycle of 30:2 does charging occur? (eg 1st, 2nd, 3rd etc) *5th*

21) After defibrillation what is the very next step?

- a. Rhythm check
- b. CPR**
- c. Ventilation
- d. High five anaesthetist
- e. Amiodarone 300mg slow iv

22) Re: answer to 22) what is the theory behind this? Starting CPR immediately after defibrillation, irrespective of the electrical success (or otherwise) of the attempt at defibrillation, restores blood flow to the brain and heart and creates a milieu more conducive to return of spontaneous circulation. A period of good CPR (e.g. for 1-3 minutes) appears to be able to increase the likelihood of success of the next attempt at defibrillation^{8, 18}

23) What monitor can be used to assess the adequacy of CPR? *ETCO₂*

24) The monitor in 23) is a safe and effective non-invasive indicator of *cardiac output*

25) During cardiac arrest, what information can arterial blood gases give you? *The degree of hypoxaemia, metabolic acidosis, electrolyte imbalance, BSLs*

26) If CPR is performed on a person not in cardiac arrest, what evidence is there of harm?

Post-mortem studies have identified a significant number of thoracic injuries after CPR. There are no data to suggest that the performance of CPR by bystanders leads to more complications than CPR performed by professional rescuers. One study documented no difference in the incidence of injuries on chest radiograph for arrest victims with and without bystander CPR. One study documented a higher rate of complications among inpatient arrest victims treated by less-experienced (non-ICU) rescuers. Two studies reported that serious complications among non-arrest patients receiving dispatch-assisted bystander CPR occurred infrequently. Of 247 non-arrest patients with complete follow up who received chest compressions from a bystander, 12% experienced discomfort; only 5 (2%) suffered a fracture; and no patients suffered visceral organ injury.

27) After return of spontaneous circulation, what respiratory rate should ventilate the patient at via endotracheal tube? *12*

Protocols for adult ALS

- 1) When do you assess the rhythm?
 - a. After 2 mins of CPR
 - b. After 5 cycles of 30:2 compressions to ventilations
 - c. As soon as the defibrillator pads are applied**
 - d. After 1mg of adrenaline is administered
- 2) What energy level is used for biphasic defibrillator shocks? *150 or 200J*
And monophasic shocks? *360J*
- 3) After commencing CPR, outline the chronological steps up until you give amiodarone (after the 3rd shock). *As per ALS flowchart*
- 4) Is there any evidence that the use of vasopressors such as adrenaline improve survival to hospital discharge? *No*
- 5) Is there any evidence that the use of antiarrhythmics such as amiodarone improve survival to hospital discharge? *No*
- 6) Is there any evidence that the routine use of other any other medications improve survival to hospital discharge? *No*
- 7) Is there any evidence for the routine use of fluids? *No*
- 8) When might fluids be useful? Suspected *hypovolaemia*
- 9) When might thrombolytics be useful? *Proven or suspected pulmonary embolism*

Electrical therapy for adult ALS

- 1) How does defibrillation work?

A defibrillation shock when applied through the chest produces simultaneous depolarisation of a mass of myocardial cells and may enable resumption of organised electrical activity.

- 2) Should you delay defibrillation in order to provide a period of CPR? *No, inconsistent evidence to support or refute*

- 3) Where is the ideal location to place defibrillation pads?

It is reasonable to place paddles or pads on the exposed chest in an anterior-lateral position. One paddle or pad is placed on the midaxillary line over the 6th left intercostal space and the other on the right parasternal area over the 2nd intercostal space. Acceptable alternative positions are the anterior-posterior (for paddles and pads) and apex- posterior (for pads). In large-breasted individuals it is reasonable to place the left electrode pad (or paddle) lateral to or underneath the left breast, avoiding breast tissue. Consideration should be given to the rapid removal of excessive chest hair prior to the application of pads/paddles but emphasis must be on minimizing delays in shock delivery

- 4) If there is a pacemaker in situ, how far away must the pads be placed?

In patients with an ICD or a permanent pacemaker, the placement of pad/paddles should not delay defibrillation. When treating an adult with a permanent pacemaker or an implantable cardioverter defibrillator, the defibrillator pad/paddle should be placed on the chest wall ideally at least 8 cm from the

generator position. The anterior-posterior and anterior-lateral pad/paddle placements on the chest are acceptable in patients with a permanent pacemaker or ICD.

5) Which provide better results, self- adhesive pads or defibrillation paddles? *Pads.*

6) What is the advantage of biphasic waveforms for defibrillation?

A single cohort study using the 2000 International Guidelines demonstrated better hospital discharge and neurologic survival with biphasic than with monophasic waveforms