Advanced cardiac life support update: the new ILCOR cardiovascular resuscitation guidelines

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INTRODUCTION

In 1974 the first American Heart Association (AHA) and Emergency Cardiac Care (ECC) standards for resuscitation were published. At that time only a few of the recommended measures were based on scientific evidence, but the medical world accepted them as international precepts that formed the gold standard for resuscitation care. Although they had been evolved only on the basis of national experience and requirements within the USA, they quickly acquired medicolegal significance both within and beyond the borders of the USA.

Since then, many additional national guidelines have been developed and published to replace or complement the 1974 standards. These include publications from the AHA in 1980, 1986 and 1992, from the European Resuscitation Council (ERC) in 1992, 1996 and 1998, and material from other council such as those from Australia and Southern Africa.

In the absence of any new scientific base, all the new guidelines have included detailed advice that remains scientifically unproved and has been justified only on clinical experience.

Against this background, the International Liaison Committee on Resuscitation (ILCOR) worked to produce agreed policy statements on cardiopulmonary resuscitation (CPR) based as much as possible on scientifically proven material, while being aware of educational aspects that demand simplification of algorithms.

ILCOR comprises the AHA, the ERC, the Australian Resuscitation Councils (ARC), the Resuscitation Council of Southern Africa (RCSA), and the Resuscitation Council of South America (Cosejo Latinoamericano de Resuscitacion; CLAR). The policy statement of ILCOR has been published in several journals and languages. Its goals are:

- to produce international guidelines supported by international science and developed by international collaboration
- to establish ILCOR as the committee responsible for co-ordinating the international science
- to determine evidence-based science
- to review and revise recommendations from past conferences, based on scientific evidence
- to review and recommend changes in methods for teaching the knowledge and skills of ECC.

Each guideline was graded according to the strength of the supporting evidence as being definitely effective (class I), probably effective (class IIa), possibly effective (class IIb), not useful (class III), or of indeterminate benefit (because of insufficient evidence).

The ERC has closely followed the ILCOR statement, which offers an authoritative European model. The ERC Advanced Life Support Working Group has considered this document and has recommended some changes in the guidelines that will be suitable for European practice.

GUIDELINES CHANGES

Basic life support (Fig. 1)

Significant changes in the basic life support (BLS) for cardiac arrest guidelines include the following:

- The carotid pulse check should be ‘de-emphasized’ for lay persons and the expression ‘look for signs of
circulation for not more than 10 s’ should be used instead (class IIa). Several studies have shown that far more than 10 s are required to diagnose reliably the presence or absence of a carotid pulse,11–13 and even with prolonged palpation significant errors occur.14

- In a one-person rescue situation in which there is not likely to be ventricular fibrillation (VF) (e.g., submersion, poisoning, trauma, respiratory arrest), the rescuer should perform CPR for 1 min before alerting the emergency medical system (EMS) (class indeterminate).
- A smaller tidal volume (400–600 ml) is recommended by the ERC15 in order to reduce gastric inflation,16 whilst the AHA recommended a volume between 800 and 1200 ml,17 as without oxygen supplementation suboptimal oxygenation may occur.18 Therefore, as a compromise, it is recommended that for adult resuscitation each rescue breath (without oxygen supplementation) should deliver a volume of 10 ml/kg, which approximates to 700–1000 ml for an average male adult (class IIb). This should be delivered slowly over about 2 s and the rescuer should take a deep breath before each ventilation.19
- In one- and two-person rescue situations, the compression to ventilation ratio should be 15:2 until the endotracheal tube is secured (class IIb).

**Fig. 1.** Algorithm for adult basic life support. Adapted with permission from reference 10 (© ERC 2001)
The rationale behind this is that, when cardiac compressions are uninterrupted, the coronary perfusion pressure is higher after 15 compressions.20

- Medical dispatchers (class IIa) should teach chest compression without ventilation, rather than no CPR.

**Relief of foreign body airway obstruction (Fig. 2)**

- Lay rescuers should be taught standard chest compression as the method of removing a foreign body in the airway of an unresponsive patient (class IIb).

- Several authorities have recommended simplification of the techniques to be used in a choking victim in order to bring about better acquisition and retention of skills,21,22 since the risk of death from myocardial infarction is greater than that of dying from choking.23 Therefore, it is recommended for lay rescuers that, if a victim of choking is or becomes unconscious, a modified sequence of BLS should be applied rather than backslaps and abdominal thrusts (Fig. 2).

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**Potential reversible causes**

- the ‘4 h’s and 4 t’s’:
  - hypoxia
  - hypovolaemia
  - hypo/hyperkalaemia
  - & metabolic disorders
  - hypothermia
  - tension pneumothorax
  - tamponade
  - toxic/therapeutic disorders
  - thrombo-embolic
  & mechanical obstruction

**Diagram**: Universal advanced life support algorithm. Adapted with permission from reference 9 (© ERC 2001)
Automated external defibrillation (Fig. 3)

- Delivery of BLS has been revised according to the new ERC BLS guidelines. After identifying the absence of normal breathing, two initial rescue breaths are delivered; this was stated in order to achieve uniformity between the automated external defibrillation (AED) and the BLS protocols.
- The carotid pulse check is no longer included in the protocol for lay rescuers. Lay rescuers will now only check for signs of circulation for no more than 10 s. Health care providers should continue to perform a carotid pulse check in addition to the other signs of circulation; this should take no longer than 10 s.11–13
- Professional healthcare providers in a witnessed or monitored arrest may perform a single precordial thump before the defibrillator is attached.25
- When ‘no shock is indicated’ or immediately after a series of three shocks, CPR should be given for 1 min. In the 1998 guidelines7 the duration of CPR was 3 min after ‘no shock indicated’, except when the massage followed a successful defibrillation, when it was 1 min. This change was made to simplify the algorithm and to improve the acquisition and retention of skills.
- If the AED protocol is to be used by advanced life support providers, adrenaline should be administered every 2–3 min, rather than during each loop cycle of CPR, which lasts only 1 min (Fig. 3).

Fig. 5. Algorithm for the management of bradycardia (including rates inappropriately slow for the haemodynamic state). AV, atrioventricular; BP, blood pressure. Adapted with permission from reference 9 (© ERC 2001)

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Adult advanced life support (Fig. 4)

Significant changes in the advanced cardiac life support (ACLS) for cardiac arrest guidelines include the following:

- The energy level and sequence of shocks is unchanged. Biphasic energies of equivalent level are acceptable. The importance of early defibrillation is strongly emphasized (class I).\textsuperscript{26,27}
- High dose adrenaline is no longer recommended (indeterminate for routine use, and class IIb if low dose failed).\textsuperscript{28,29}
- Vasopressin 40 U (one dose only) is an acceptable alternative to adrenaline in VF/pulseless ventricular tachycardia (VT) refractory to the first three shocks (class IIb).\textsuperscript{30,31}
- Amiodarone is an acceptable alternative to lignocaine in shock-refractory VF/VT (class IIb).\textsuperscript{32–35}
- Lignocaine \textsuperscript{36–42} and procainamide \textsuperscript{43} (class IIb) are alternatives if amiodarone is not available, but should not be given in addition to amiodarone.
- Magnesium (8 mmol) is recommended for refractory VF if there is a suspicion of hypomagnesaemia (class IIb).\textsuperscript{44}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{algorithm.png}
\caption{Algorithm for the management of atrial fibrillation. Adapted with permission from reference 9 (© ERC 2001)}
\end{figure}
Bretylium is no longer recommended.\textsuperscript{45,46} Evidence supporting the use of lignocaine for shock-refractory VF has been downgraded to 'class indeterminate'\textsuperscript{38,42}.

Amiodarone is the drug of choice for stable wide-complex tachycardia in patients with impaired cardiac function, while procainamide can be used for those with normal function (class IIb).\textsuperscript{47,48}

Tracheal intubation remains the optimal method of securing the airway. However, this requires skills, and misplaced or displaced tracheal tubes have been reported. The new guidelines\textsuperscript{9} emphasize the need to confirm the accuracy of the tube placement in perfusing rhythm by quantitative and qualitative measurement of the end-tidal CO\textsubscript{2}, or by oesophageal detector, in addition to the routine clinical methods (class IIb). With a non-perfusing rhythm, the oesophageal detector is a more reliable way of confirming accurate tube placement.

Training in the use of alternative airways, such as laryngeal masks and combitubes, should be encouraged (class IIa).

All caregivers responsible for BLS should be trained in the use of bag-valve-mask ventilation (class IIa).

Once the patient’s airway is secured, chest compression should continue uninterrupted at a

\textbf{Fig. 7.} Algorithm for the management of narrow complex tachycardia (presumed supraventricular tachycardia). WPW, Wolff–Parkinson–White. Adapted with permission from reference 9 (\textcopyright ERC 2001)
rate of 100/min and ventilation should be continued at approximately 12 breaths/min. Ventilation does not need to be synchronized with chest compression as uninterrupted chest compressions result in higher coronary perfusion pressures.20

- Other circulatory adjuncts are approved as alternatives to standard external chest

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*Note 1: For paroxysms of torsades pointes, use magnesium or overdrive pacing (expect help strongly recommended).

†Note 2: DC shock is always given under sedation/general anaesthetic.

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**Fig. 8.** Algorithm for the management of broad complex tachycardia. Adapted with permission from reference 9 (© ERC 2001)
compressions, \(^{49}\) including active compression-decompression (ACD), \(^{50-54}\) interposed abdominal compression (IAC) CPR, \(^{55,56}\) vest CPR, \(^{57-59}\) mechanical (piston) CPR, \(^{60}\) direct cardiac massage CPR \(^{61-63}\) and impedance threshold valve CPR. \(^{64,65}\) All these techniques are defined as class IIb.

- The sequence of the ERC bradycardia algorithm has been slightly modified. Isoprenaline is no longer recommended; if external pacing is not available, a low dose adrenaline infusion is recommended instead (Fig. 5).
- Patients with atrial fibrillation or flutter are placed into one of three risk groups on the basis of the heart rhythm and the presence of additional signs and symptoms. If the patient is at high risk, electrical cardioversion should be attempted after heparinization (Fig. 6).
- If the patient is pulseless in association with a narrow complex tachycardia with a rate greater than 250/min, cardioversion should be attempted; otherwise, vagal manoeuvres should be tried first. Adenosine is the drug of first choice (class IIa) (Fig. 7).
- If there is no pulse, then the VF algorithm should be followed. If the patient displays adverse signs or the rhythm is unresponsive to drugs (amiodarone or lignocaine), electrical cardioversion should be attempted (Fig. 8).

**CONCLUSIONS**

Although some of their suggestions are controversial, these guidelines offer the best consensus on cardiac arrest and pre-arrest management from experts around the world. Therefore they should be read and considered by anyone managing or teaching adult cardiac arrest.

**REFERENCES**


