Advanced Life Support in Perspective

CHAPTER 1

The problem

Ischaemic heart disease is the leading cause of death in the world. In Europe, cardiovascular disease accounts for around 40% of all deaths under the age of 75 years. Sudden cardiac arrest is responsible for more than 60% of adult deaths from coronary heart disease. Summary data from 37 communities in Europe indicate that the annual incidence of emergency medical system (EMS)-treated out-of-hospital cardiopulmonary arrests (OHCAs) for all rhythms is 38 per 100,000 population. Based on these data, the annual incidence of EMS-treated ventricular fibrillation (VF) arrest is 17 per 100,000 and survival to hospital discharge is 10.7% for cardiac arrest from all rhythms and 21.2% for VF cardiac arrest. Recent data from 10 North American sites are remarkably consistent with these figures: median rate of survival to hospital discharge was 8.4% after EMS-treated cardiac arrest from any rhythm and 22.0% after VF. There is some evidence that long-term survival rates after cardiac arrest are increasing. On initial heart rhythm analysis, about 28 - 35% of OHCA victims have VF, a percentage that has declined over the last 20 years. It is likely that many more victims have VF or rapid ventricular tachycardia (VT) at the time of collapse but, by the time the first electrocardiogram (ECG) is recorded by EMS personnel, the rhythm has deteriorated to asystole. When the rhythm is recorded soon after collapse, the proportion of patients in VF is about 60%.

One third of all people developing a myocardial infarction die before reaching hospital; most of them die within an hour of the onset of acute symptoms. In most of these deaths the presenting rhythm is VF or pulseless ventricular tachycardia (VF/VT). The only effective treatment for these arrhythmias is attempted defibrillation and, in the absence of bystander CPR, with each minute's delay the chances of a successful outcome decrease by about 10 - 12%. Once the patient is admitted to hospital the incidence of VF after myocardial infarction is approximately 5%.

The incidence of in-hospital cardiac arrest is difficult to assess because it is influenced heavily by factors such as the criteria for hospital admission and implementation of a do-not-attempt-resuscitation (DNAR) policy. The reported incidence of in-hospital cardiac arrest is in the range of 1 - 5 per 1000 admissions. Preliminary data from the UK National Cardiac Arrest Audit (NCAA) indicate that survival to hospital discharge after in-hospital cardiac arrest is 13.5% (all rhythms). The initial rhythm is VF or pulseless VT in 18% of cases and, of these, 44% survive to leave hospital; after PEA or asystole, 7% survive to hospital discharge. These preliminary NCAA data are based on 3,184 adults (aged ≥ 16 y) in 61 hospitals participating in NCAA (increasing numbers of hospitals during Oct 2009 to Oct 2010) with known presenting/first documented rhythm and complete data for return of spontaneous circulation (ROSC) and survival to hospital discharge. All these individuals received chest compressions and/or defibrillation from the resuscitation team in response to a 2222 call. Many in-hospital cardiac arrests did not fulfil these criteria and were not included. Many patients sustaining an in-hospital cardiac arrest have significant comorbidity, which influences the initial rhythm and, in these cases, strategies to prevent cardiac arrest are particularly important.

The Chain of Survival

The interventions that contribute to a successful outcome after a cardiac arrest can be conceptualised as a chain - the Chain of Survival (Figure 1.1). The chain is only as strong as its weakest link; all four links of the Chain of Survival must be strong. They are:

- Early recognition and call for help
- Early cardiopulmonary resuscitation (CPR)

Figure 1.1

- Early defibrillation
- Post-resuscitation care.

Early recognition and call for help

Out of hospital, early recognition of the importance of chest pain will enable the victim or a bystander to call the EMS so that the victim can receive treatment that may prevent cardiac arrest. After out-of-hospital cardiac arrest, immediate access to the EMS is vital. In most countries access to the EMS is achieved by means of a single telephone number (e.g. 999, 112).

In-hospital, early recognition of the critically ill patient who is at risk of cardiac arrest and a call for the resuscitation team or medical emergency team (MET) will enable treatment to prevent cardiac arrest (Chapter 3). A universal number for calling the resuscitation team or MET should be adopted in all hospitals - in the UK this number is 2222. If cardiac arrest occurs, do not delay defibrillation until arrival of the resuscitation team - clinical staff should be trained to use a defibrillator.

Early CPR

Chest compressions and ventilation of the victim's lungs will slow down the rate of deterioration of the brain and heart. After out-of-hospital cardiac arrest, bystander CPR extends the period for successful resuscitation and at least doubles the chance of survival after VF cardiac arrest. Performing chest-compression-only CPR is better than giving no CPR at all. Despite the well-accepted importance of CPR, in most European countries bystander CPR is carried out in only a minority of cases (approximately 30%). After in-hospital cardiac arrest, chest compressions and ventilation must be undertaken immediately, but should not delay attempts to defibrillate those patients in VF/VT. Interruptions to chest compressions must be minimised and should occur only very briefly during defibrillation attempts and rhythm checks.

Early defibrillation

After out-of-hospital cardiac arrest, the goal is to deliver a shock (if indicated) within 5 min of the EMS receiving the call. In many areas, achievement of this goal will require the introduction of Public Access Defibrillation (PAD) programs using automated external defibrillators (AEDs). In hospitals, sufficient healthcare personnel should be trained and authorised to use a defibrillator to enable the first responder to a cardiac arrest to attempt defibrillation when indicated, without delay, in virtually every case.

Post-resuscitation care

Return of a spontaneous circulation (ROSC) is an important phase in the continuum of resuscitation; however, the ultimate goal is to return the patient to a state of normal cerebral function, a stable cardiac rhythm, and normal haemodynamic function, so that they can leave hospital in reasonable health at minimum risk of a further cardiac arrest. The quality of treatment in the post-resuscitation period influences the patient's ultimate outcome. The post-resuscitation phase starts at the location where ROSC is achieved. The ALS provider must be capable of providing high quality post-resuscitation care until the patient is transferred to an appropriate high-care area.

Science and guidelines

The 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations was the culmination of a prolonged period of collaboration between resuscitation experts from around the world. It followed a similar format to the 2005 International Consensus on CPR Science. The European Resuscitation Council (ERC) Guidelines for Resuscitation 2010 are derived from the 2010 consensus document and the contents of this ALS provider manual are consistent with these guidelines. Most resuscitation organisations in Europe have ratified and adopted the ERC guidelines.

ALS algorithm

The ALS algorithm (Figure 1.2) is the centre point of the ALS course and is applicable to most cardiopulmonary resuscitation situations. Some modifications may be required when managing cardiac arrest in special circumstances (Chapter 12).

The ALS course

The ALS course provides a standardised approach to cardiopulmonary resuscitation in adults. The course is targeted at doctors, nurses, and other healthcare professionals who are expected to provide ALS in and out of hospital. The multidisciplinary nature of the course encourages efficient teamwork. By training together, all ALS providers are given the opportunity to gain experience as both resuscitation team members and team leaders.
The course comprises workshops, skill stations, cardiac arrest simulation (CAS) training, and lectures. Candidates' knowledge is assessed by means of a multiple choice question paper. Practical skills in airway management and the initial approach to a collapsed patient (including defibrillation where appropriate) are assessed continuously. There is also assessment of a simulated cardiac arrest (CASTest). Candidates reaching the required standard receive an ALS provider certificate. Resuscitation knowledge and skills deteriorate with time and therefore recertification is required for those who have not recently undertaken the course. Recertification provides the opportunity to refresh resuscitation skills and to be updated on resuscitation guidelines, and can be undertaken by attending a provider course or an accredited recertification course. All ALS providers have a responsibility to maintain their skills in resuscitation and to keep up to date with changes in guidelines and practice, and the requirement for recertification should be seen as an absolute minimum frequency of refreshing skills and knowledge.

Adult Advanced Life Support

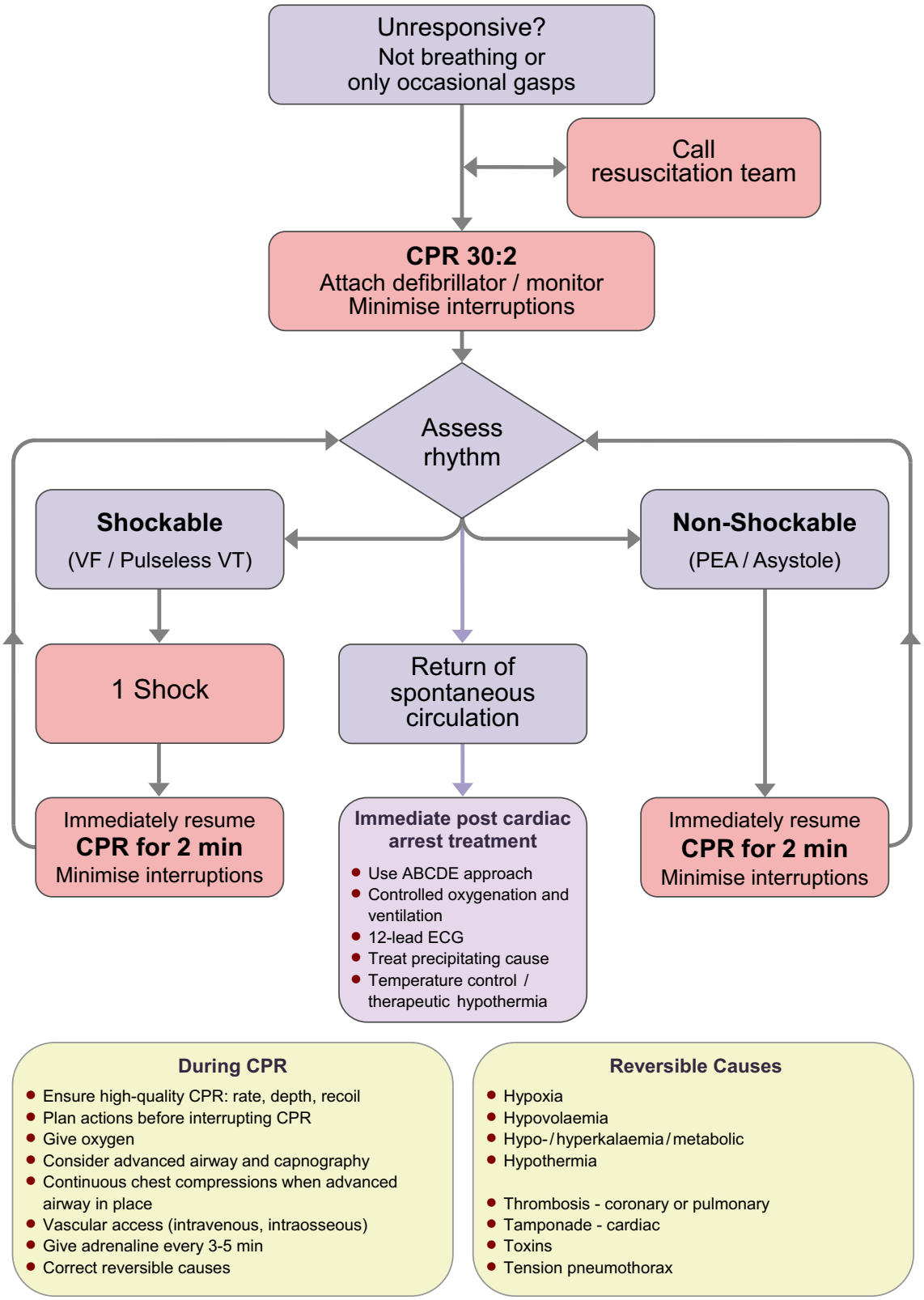

Figure 1.2 Adult Advanced Life Support

Further reading

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