



Policy conference

## ESC-ERC recommendations for the use of automated external defibrillators (AEDs) in Europe<sup>☆</sup>

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### The need for a policy conference on the use of automated external defibrillators

The use of automated external defibrillators (AEDs) has a major impact in the management of cardiac arrest and substantial implications for public health. It is therefore important for the European Society of Cardiology (ESC) and the European Resuscitation Council (ERC) to join forces to develop European recommendations for legislation on defibrillation, for training in AED use and for the development of AED community programmes.

To fulfil these objectives a Policy Conference was organised jointly by ESC and ERC in December 2002 at the European Heart House in Sophia Antipolis, France. The conference was convened after the publication of the guidelines on prevention of sudden cardiac death by the ESC<sup>1</sup> and the international guidelines for CPR by ILCOR.<sup>2</sup> Both documents had highlighted the concept that success in the fight against premature sudden cardiac death is influenced by the efficacy of in-hospital and out of hospital resuscitation.

The present document is the result of that policy conference and it has four key objectives:

- (1) To provide a critical appraisal of the studies published in the scientific literature on the use of AEDs.
- (2) To present data on the status of legislation/organisation of defibrillation by non-medically qualified rescuers in Europe.

- (3) To promote recommendations for the organisation of AED programmes in Europe that were collected and discussed during the policy conference.
- (4) To identify the areas in which more research is needed before evidence based guidelines for the use of AEDs can be developed.

An appendix to the full document is published on-line on the ESC and ERC websites [www.escardio.org](http://www.escardio.org) and [www.erc.edu](http://www.erc.edu) and this executive summary is published simultaneously in the European Heart Journal and in Resuscitation.

### The role of AEDs in the prevention of sudden cardiac death

Sudden cardiac death remains the single most important cause of premature death in the adult population of the industrialised world despite its recent slow decline in incidence.<sup>3</sup> The incidence of out-of-hospital sudden cardiac death varies with age, gender, and the presence or absence of cardiovascular disease. Several studies have helped to define the profile of sudden cardiac death victims.<sup>4,5</sup> The Maastricht study<sup>6</sup> monitored all cases of out-of-hospital cardiac arrest occurring in victims between 20 and 75 years of age and confirmed the estimate that sudden cardiac death has an incidence of approximately 1 per 1000 per year. Overall, 21% of all deaths occurring in men and 14.5% of those in women were sudden and unexpected. Eighty per cent of out-of-hospital cardiac arrests occurred at home and about 15% on the street or in a public place. This preponderance of sudden death at home has not been found in all studies in relation to adults up to the age of 60,<sup>7</sup> but it is likely to

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be universally true for the older age groups in which sudden death is most common.

Subgroups of patients with coronary artery disease at higher risk of sudden death can be identified on the basis of their clinical profile, including evidence of previous myocardial infarction, ischaemia, impaired left ventricular function, and ventricular tachyarrhythmias. Diagnostic examinations, drugs, devices and procedures are available for the identification and treatment of these patients so that their risk of sudden cardiac death can be reduced. However, the efficacy of these interventions on the reduction of the overall number of sudden death is limited by the fact that most cardiac arrests are the first manifestation of heart disease.<sup>8</sup> The unexpected sudden deaths that occur in previously apparent healthy individuals cannot be predicted; survival of these individuals therefore depends on the availability of defibrillation within 4–5 min from the onset of ventricular fibrillation.<sup>9</sup>

### Strategies for community defibrillation with AEDs

The strategies available for organising a community programme for early defibrillation should be tailored to each specific environment. One of the first objectives when planning a new project is to achieve a compromise between the widespread distribution of AEDs and the economical feasibility of the programme in terms of the available resources. A decision must be made at an early stage as to whether a programme is to be designed within the professional Emergency Medical Service (EMS) or designed to be outside the EMS. This decision depends on local factors that will vary widely between countries. For example, police and fire fighters may fall within or outside the EMS depending on the scope of their professional roles.

Data on the incidence and location of sudden cardiac death collected from local ambulances and experience gleaned from the literature will help to define the most suitable system for each environment.

A systematic review of the literature is discussed and presented as Section 1 in the on-line Appendix ([www.escardio.org](http://www.escardio.org) and [www.erc.edu](http://www.erc.edu)). We provide here a summary of the most relevant information.

### AED programmes within the EMS

Defibrillation programmes within the EMS were the first to be implemented because of the limitations of first on scene rescue teams able to provide CPR to cardiac arrest victims but either not capable or not allowed to defibrillate. The early studies demonstrating that defibrillation by basic ambulance personnel can save lives were conducted with manual defibrillators.<sup>10–12</sup> With the introduction of AEDs<sup>13,14</sup> several projects were initiated in European countries. However, progress was delayed in some of them because legal barriers had to be removed before defibrillation could be performed by non-medically trained individuals.

### Recommendation 1

*The goal of achieving an effective AED programme within the EMS should become a fundamental objective in every European country. Accordingly, it is recommended that an AED and properly trained personnel should be placed in every vehicle that may transport patients at risk of cardiac arrest. This should be the first priority for an early access defibrillation programme.*

### AED programmes outside the EMS

Analysis of the literature shows that there are three main strategies for the implementation of defibrillation programmes outside the EMS: community programmes, on-site programmes and home programmes.

#### Community programmes

The initial programmes on the use of AEDs outside the EMS involved community responders such as police officers and fire-fighters.<sup>14–17</sup> More recently data have become available from studies based on on-site schemes in which AEDs have been placed in strategic locations such as airports<sup>18–20</sup> and casinos<sup>21</sup> – or a hybrid approach with on-site AED location plus involvement of community responders.

Several studies suggest that a tiered response system (e.g. with police officers using AEDs to support the traditional EMS) increases survival rates even if it reduces the time-to shock only by one or two minutes.<sup>22</sup> Some schemes, however, have not been able to replicate this success.<sup>23</sup> Overall survival rates in the various studies vary from <3% to >50%. Time to shock is remarkably different among studies, ranging approximately from an estimated 2 to 11 min. Best survival rates are usually obtained among those patients in whom defibrillation is delivered within a few minutes and where the restoration of spontaneous circulation is obtained by defibrillation only without requiring additional advanced life support (ALS) interventions.<sup>15,22,24</sup>

#### In hospital and on-site programmes

The vast majority of cardiac arrests occur in the out-of-hospital setting. This may be the reason why early in-hospital defibrillation has been less extensively investigated.<sup>25</sup> However, the time to defibrillation may be delayed if the patient has to wait for an emergency team before receiving the first shock. This is the case especially in larger hospitals where high-risk subjects are likely to be present. For these reasons it seems reasonable to advocate deployment of AEDs at various locations within hospitals (wards, hospital lobbies, cafeterias, parking lots) and training of all medical and non-medical personnel working within the hospital to defibrillate and perform CPR. Unfortunately at present, large studies evaluating the survival benefit of deployment of AEDs in the hospitals are not yet available. The Panel agrees that improvement of access to defibrillation inside the hospitals should be a high priority.

In seeking a reduction of the time from the onset of ventricular fibrillation to defibrillation, deployment of

AEDs in public places is a very attractive option. Two large-scale observational studies involving airlines have been carried out.<sup>19,26</sup> Both studies reported remarkable results for treatment of witnessed VF with >55% survival and confirmed that time-to-shock is a major determinant of success. However, a high incidence of unwitnessed cardiac arrest and non-shockable rhythms also occurs.<sup>26</sup> The survival from witnessed and unwitnessed cardiac arrest was also evaluated in an observational study performed in casinos.<sup>21</sup> Among subjects in whom VF was the initial recorded rhythm the overall survival to hospital discharge rate was 53%, but survival was 74% for those patients who had a witnessed event and received the first shock  $\leq 3$  min from collapse. The programme in Chicago O'Hare airport is another interesting on-site programme that provided encouraging short and long-term results.<sup>18</sup>

### Home programmes

The great majority of out-of-hospital cardiac arrests occurs at home,<sup>6,27</sup> prompting the need for a careful assessment of the possible positive impact of AED deployment at patients' homes. Several categories of patients could potentially benefit from AEDs in the home, e.g. high risk post myocardial infarction patients when an implantable defibrillator is not indicated,<sup>28</sup> not available, or not planned immediately, patients listed for heart transplant and patients/families with inherited arrhythmogenic diseases. Beside in-home AEDs, wearable devices might become a possible alternative for such higher risk subgroups of patients.<sup>29</sup>

An early experience with home use of AEDs in small groups of patients showed no benefit,<sup>30</sup> but more recently Snyder et al.<sup>31</sup> provided more encouraging data. Psychological issues are among the major concerns for a widespread deployment of AEDs at home for the high-risk individuals. Indeed, at least some of the published evidences show that failure to apply basic life support (BLS) by family members or other lay bystanders may be due to their anxiety related to their personal performance.<sup>32</sup>

### Recommendation 2

**Several models for the implementation of AED programmes outside the EMS have been described: we have identified three main strategies that have different and to some extent opposite characteristics (Table 1). It is recommended that once the priorities of implementation of an AED programme within the EMS have been achieved, a careful analysis is conducted in order to identify the community model that is most suitable for the specific environment. A cost-effectiveness analysis is an essential part of the implementation strategy. Every hospital should analyse whether the goal of early defibrillation is achieved and AED implementation can be an important element in improving the in-hospital chain of survival. Home programmes are still in a preliminary phase of implementation: families with a genetic predisposition to sudden cardiac death and families with high risk individual(s) who are not scheduled for, or cannot receive,**

**an ICD represent the primary target for pilot projects on home defibrillation.**

### Cost effectiveness

Few clinical studies have been specifically designed to address this issue<sup>25</sup> and at the present time there are only rough estimates of the cost involved. In the OPALS study,<sup>33</sup> a cost of 46,900 US\$ per life saved was calculated for establishing the early defibrillator programme and 2400 US\$ per life saved annually for maintaining the programme. In a study by Capucci et al.,<sup>34</sup> the costs were 270,000 US\$ to acquire 39 AEDs and train 1285 volunteers over a period of 22 months of observation in a medium sized community.

Forrer et al.<sup>35</sup> estimated retrospectively the cost effectiveness of a 7-year police AED programme in four suburban communities. The estimated cost per life saved as a result of decreasing the time to first shock with the P-AED programme was 70,342 US\$ with the estimated cost per year of life saved of 16,060 US\$.

Cost-effectiveness of early defibrillation in public places was evaluated by Groeneveld et al.<sup>36</sup> who analysed by simulation the costs associated with airline AED programmes. The conclusion of that study was that the cost-effectiveness of placing AEDs on commercial aircraft compares favourably with the cost-effectiveness of widely accepted medical interventions, but it was more evident with deployment on large aircraft. Nichol et al.<sup>37,38</sup> provided additional data by performing a meta-analysis of published clinical trials. Public access defibrillation by community responders was associated with a median cost of 44,000 US\$ per additional quality-adjusted life year (QALY), while programmes involving police had a cost of 27,000 US\$ per QALY. In casinos,<sup>38</sup> standard EMS was associated with median cost of 24,800 US\$ per cardiac arrest, and early defibrillation by security guards was associated with an incremental cost of median 14,100 US\$, per additional QALY. Cost of AED programmes may vary significantly according to deployment locations: in airports early defibrillation by lay responders was associated with incremental cost of 55,200 US\$ per QALY, while in health club gymnasias costs were 4,759,200 US\$.<sup>38</sup>

### AED: legislation and organisation in Europe

Unfortunately, AED programmes are still only partially implemented in Europe: reasons for slow implementation are lack of awareness and discrepancies in the organisational and legislative aspects. The structure and organisation of EMS systems and the legislation concerning defibrillation are still largely variable in Europe. In some countries there is no law that regulates the use of defibrillators. The absence of specific legislation should, in theory, not be a formal obstacle, but it may nevertheless slow down implementation of schemes. The use of AEDs may also come within the responsibility of medical authorities. Where legislation is established it should permit trained health care workers and lay people to use AEDs.

**Table 1** Strategies for early defibrillation outside the Emergency Medical System

	Community responder	On site responder (including bystander defibrillation)	Home responder
Location of victim	All areas, including home	Public or private areas, excluding home	Home
Training level	High	Moderate to untrained (for bystander defibrillation)	Moderate
Number of reachable victims	High	Limited	Low (relatives only)
Number of AEDs needed	Moderate	High	One per home
Time interval collapse-defibrillation	Reduction is limited	Potentially very short	Very short

Although the European Union recommended in 1997 that the emergency telephone number 112 should be operational in all member states, this goal is still far from being accomplished.

The Panel has performed a survey by distributing a questionnaire to key physicians actively involved in EMS systems and in out-of-hospital resuscitation in order to obtain updated information on legislation and organisation of defibrillation in Europe. The outcome of the survey is reported as Section 2 in the on-line Appendix ([www.escardio.org](http://www.escardio.org) and [www.erc.edu](http://www.erc.edu)). Data emerging from the survey suggest that there are striking differences in the organisation of the EMS system in Central and Eastern European countries compared with Western European countries. In most Central and Eastern European countries, but only in few Western European countries, a medical doctor has an active role in the first responding emergency team, and very often is responsible for operating a manual defibrillator carried on the ambulance. In most Western European countries, the first responding emergency team consists of ambulance personnel with a qualification for performing BLS indicating the existence of an infrastructure for providing early defibrillation. In most European countries, police are not integrated into the EMS system. Fire fighters, on the other hand, are a fundamental component of EMS systems in several countries.

#### Recommendation 3

**Legislation in Europe is heterogeneous but where it has relevance to AEDs it either has permitted or is likely to permit their use by non-medically qualified first responders. Automated external defibrillation does not require establishing a clinical diagnosis and therefore it should be lifted from the list of actions "reserved to doctors". Slow implementation is mainly the result of limited perception of the importance of early defibrillation programmes and by traditions and reluctance to "de-medicalise" the act of defibrillation. The lack of data on cost-effectiveness may discourage the support of governments for AED programmes. Therefore, this type of economical evaluation should be part of any planned developments. European legislation or recommendation issued by European policy makers and supported by all relevant major health**

**care and scientific societies could promote implementation of this life saving strategy that is strongly supported by scientific evidence.**

### AED programmes in Europe: SWOT analysis

The Members of the Policy Conference applied a systematic approach to the evaluation of the current situation on the use of AEDs in Europe by performing a "SWOT Analysis". This approach consists in the identification of the Strengths, Weaknesses, Opportunities and Threats for early defibrillation programmes in Europe.

The results of the SWOT analysis are reported in Table 2 and are commented in Section 3 in the on-line Appendix ([www.escardio.org](http://www.escardio.org) and [www.erc.edu](http://www.erc.edu)). Overall, the SWOT analysis was very encouraging, but pointed to the need for the identification of a basic set of general criteria that should be followed in order to initiate an early defibrillation programme.

### How should AED programmes be organised in Europe?

Several variables inherent to the local environment (topography of the area, road traffic conditions, location of a hospital with an ER, etc.) may play a critical role in determining the choices for implementing early defibrillation in the community. Therefore, a standardised set of rules cannot be established. Nonetheless, the experience gathered over the years may allow the definition of a basic set of general criteria that should be followed, independently of the local environment and of the type of activity to be undertaken (e.g. programmes within the EMS, community programmes, on-site programmes, or home programmes).

#### Recommendation 4

**The Panel has reached a Consensus that an effective early defibrillation programme requires the setting of priorities and the integration of at least five different areas of activity:**

- **Analysis of local conditions and identification of priorities.**
- **Identification of intervention protocols.**

**Table 2** SWOT analysis

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Robust scientific background</li> <li>• Adequate technology</li> <li>• Established collaboration between different professionals</li> <li>• Public awareness in response to educational activities</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Enthusiasm among healthcare providers</li> <li>• To collaborate by non-conventional responders</li> <li>• Increasing awareness of politicians towards SCD prevention</li> </ul>	<p><b>Weakness</b></p> <ul style="list-style-type: none"> <li>• Lack of uniform data collection</li> <li>• Cost-effectiveness poorly defined</li> <li>• Non homogeneous legislation</li> <li>• Still sub-optimal EMS response times</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Heterogeneous fund raising undefined</li> <li>• Not all stakeholders systematically involved in planning and supporting AED programmes</li> <li>• Competition with other health priorities</li> </ul>
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- **Identification and training of responders.**
- **Efficient data – reporting and quality control systems.**
- **Constant maintenance.**

*All such activities are tightly linked: if one fails, the entire programme will probably be threatened. Accordingly, planning a defibrillation programme should include strategies and resources for all the components that will be discussed below. Furthermore, in order to establish an out-of-hospital early defibrillation programme with the endpoint of providing effective care for the largest possible section of the community in any given area, organisers should try to follow logical steps of development.*

### Analysis of local condition and identification of priorities

The analysis of local conditions is the initial crucial step for implementation. Almost all subsequent phases necessarily should take into account the environment and the logistics of the area in which the programme has to be activated. For instance such analysis is critical in deciding if AEDs have to be deployed only in mobile units (EMS, Fire fighters, Police, etc.) or in fixed strategic positions, or using a combination of the two. All of the possible logistical barriers hampering fast access to the scene of cardiac arrest should be considered. Among the major factors that should be taken into account is the high probability of traffic congestion in the larger urban communities and poor access to small country or mountain communities. Whenever such circumstances are identified, an early defibrillation programme should also include the deployment of fixed AED locations. However, the potential benefit of having AEDs deployed in strategic locations should be based on the assessment of the number of expected interventions and the high cost of training and maintenance of these programmes.<sup>18,21,34</sup> Other locations for AEDs need to be selected on the basis of local conditions: several variables inherent to the local environment (topography of the area, road traffic condition) are of central importance in influencing the success of a project. The establishment of pilot projects as a preliminary step to the realisation of large-scale and long-term programmes may provide a

valuable approach. Pilot projects may help to refine strategies and protocols including the dispatching system, and the definition of whom to include in the first responders system. When creating a pilot project, care should be taken to ensure that the project is representative of the full-scale initiative that will follow.

#### Recommendation 5

*In order to establish an effective programme, every attempt should be made to acquire exhaustive data on the prevalence and epidemiology of sudden death in the area. This allows the requirements for the success of the programme to be set and quantification of the resources (manpower and devices) that will be required. Although it is appreciated that detailed baseline epidemiological data may be lacking in some areas, it is important to consider that the data collected during the planning phase can have an impact on the cost-effectiveness and the overall success of the programme.*

### Identification of intervention protocols

The protocols of intervention require the standardisation of two major processes, the dispatching system and clinical actions. The dispatching system has a primary responsibility for the processing and prioritisation of calls. Ideally, a centralised system should collect all calls and alert all responders simultaneously (EMS, Police, Fire fighters, Lay Volunteers, etc.). Evidence in the literature supports the benefit of extending responsibility for intervention to the responders outside the EMS such as police officers.<sup>16,33,34,39,40</sup> The dispatch protocol should be clear and easy to follow, and should include critical questions to be made to the callers (e.g. "does the patient breath normally?"). Training of dispatchers constitutes an important step in the implementation of early defibrillation programmes.

The protocol for clinical actions in the field must include: (1) the sequence of events following the arrival to the scene, (2) the management of the different scenarios that may precede medical intervention, (3) simultaneous arrival of EMS and non-conventional responders, and (4) data concerning the actions carried out by bystanders before the arrival of any first responder unit.

**Recommendation 6**

*The dispatching system and the clinical intervention protocol need to be standardised. A centralised dispatching system that can activate all responders is considered the best model. The intervention protocol should standardise all clinical actions following arrival on scene and include collection of all relevant data for systems monitoring.*

**Identification and training of the first responders****Identification of responders**

Identification and training of the EMS, community, on-site, and home responders should be guided by analysis of the local environment but should never operate independently of the EMS. Communities that readily are covered by the EMS will probably benefit most by equipping all EMS vehicles with AEDs if they do not already have them, with appropriate training for all personnel including physicians, nurses and paramedics. Placing AEDs in fixed locations within the community as illustrated in Piacenza<sup>34</sup> seems a promising approach. This strategy requires training of a large proportion of the community in the use of AEDs and efficient liaison with the EMS system.

AEDs can be used safely and effectively by rescuers with minimal or no previous AED training (both children and adults), although speed, compliance, and safety can still be improved.<sup>41</sup> These studies support that the use of publicly accessible AEDs by citizens is feasible, and that organised AED training should also focus on community responders and on-site responders.

**Recommendation 7**

*The identification of potential responders should be based on an analysis of local conditions. Where the EMS can provide adequate coverage, reinforcing the existing system may be an effective strategy. Deployment of AEDs at fixed locations in the community represents an alternative strategy that should now be considered feasible, safe and effective even if requires training of a large proportion of the community in the use of AEDs and in alerting the EMS system.*

**Training of responders**

In 1998, the ERC recommended that a BLS course should last about 3–4 h and an AED course should last about 3 h, depending on previous knowledge and skills of the target group. However, many factors may influence the efficacy of an AED training session and its duration when the target group is made of medically untrained individuals. These factors include not only the learning skills of the candidates but also the ability of the trainers to adapt their teaching techniques to specific groups of trainees.

Among the key factors influencing the duration and the efficacy of training are:

- Background of the candidates.
- Instructor–trainer ratio (individual guidance and tutoring will enhance the efficiency of the training).
- Number of trainees per AED (hands-on time).

All current AEDs have reliable ECG analysis and appropriate voice prompts, so that memorisation and recall of the defibrillation protocol is unnecessary. The well documented rapid decay of resuscitation skills should therefore have little adverse effect on the efficacy of defibrillation.<sup>42–45</sup>

A new area of debate centres on whether CPR is an important component of training for rescuers who are not healthcare professionals. Some studies indicate that survival can increase when rescuers use an AED without delivery of BLS.<sup>34</sup> However, other studies show that BLS can increase survival significantly if combined with early defibrillation.<sup>46</sup> Some authors, however, have not questioned the potential value but rather the feasibility of CPR undertaken by lay people. Concern has been raised about reluctance among lay persons to perform CPR on a stranger using mouth-to-mouth ventilation due to aversion or fear of infection. Therefore, concern exists that linking CPR administration to defibrillation may limit the acceptance of AEDs. The use of chest compressions only as a substitute for CPR may represent an acceptable alternative for lay persons but this needs further research.<sup>47–49</sup>

Until a final answer to this question is provided, it seems reasonable to support the view that combined BLS and AED training should be recommended. In some circumstances AED training may appropriately precede BLS training.

**Recommendation 8**

*Training of responders should include BLS and AED skills, the duration depending on a number of factors including previous knowledge and skills of the target group. The need for teaching BLS to non medical personnel is currently a matter of debate as some successful experiences have been conducted based on training of defibrillation only. For the time being it seems reasonable to support the view that combined BLS and AEDs training should be recommended even if in some circumstances it may be appropriate that AED training precedes BLS training.*

**Data reporting and quality control system**

Setting up an early defibrillation project is relatively straightforward. Making it work well, however, requires continuous surveillance, data reporting, and quality control. Such data collection should include process data (time intervals, BLS, ALS) and outcome. In addition to short-term outcome information is also needed on survival to discharge from hospital and long-term survival rates, with information on any residual chronic disabilities possibly resulting from the index event. As the interval from collapse to defibrillation is the major determinant of survival, this information must be

collected and described in detail. It is appreciated that accurate recording of the time of collapse can be reliable only within research protocols where it is "core" information. In other cases, this interval is "optional" and the time from first call to EMS arrival may be taken as a substitute. Defibrillation time can be retrieved directly from the electronic time recordings of dispatch centres and AEDs. These sources must be corrected for time drift to allow calculation of meaningful time intervals.

The AED is the only source of documentation of the first rhythm before the first shock is given. This is important for further clinical management (specifically arrhythmia management, revascularisation, and ICD implantation): it must be made available to the treating physician. A system to retrieve this data from the AED must be set up in the community, and made available both for clinical use and for data reporting.

Data reporting is a valuable tool for the assessment of the impact of the programme on survival. A centralised database should be developed for detailed data analysis and programme monitoring. The standardisation of data collection for benchmarking between all the early defibrillation programmes in Europe is recommended. The implementation of a uniform methodology will allow comparisons of programmes and reliable cost-effectiveness analysis. The "Utstein style" represents the recommended standard of practice both inside and outside hospital for the uniform reporting of clinical data from the patient suffering from cardiac arrest. The Utstein style delineates time and establishes a set of core and optional times to be recorded that provide important characteristics of the response of victims of cardiac arrest:<sup>50</sup> yet several reports have highlighted the difficulty in following the rather complex Utstein format. It is recommended that in the pilot phase of a project the adherence of the team to the selected reporting format is assessed in order to design a template that is well-structured but also feasible in each individual setting.

#### *Recommendation 9*

***It is important that in every early defibrillation programme data collection and assessment of the results is carefully designed. International standards for uniform data collection are being developed. This is essential for monitoring and benchmarking of the programme. Continuation of a project is likely to require evidence of its efficacy and its quality that will have to be demonstrated through a data collection protocol that is methodologically sound.***

#### **Programme maintenance**

Continual data collection and monitoring is also relevant to programme maintenance, since it allows fine-tuning of programme strategies and protocols once the programme has been implemented.<sup>51</sup> Long-term maintenance should also include protocols for regular testing of all devices, battery replacements, proper storage of fixed AEDs, pad packaging control, and replacement when needed

(according to manufacturer specifications). Re-training of first responders is also crucial. Each programme must include protocols for re-training that should have at least an annual basis. Periodical assessment of skill retention by both professional and non-conventional responders will allow developing better teaching tools and strategies.

#### *Recommendation 10*

***It is important that when budgeting the cost of an early defibrillation programme, the annual costs should include an allowance for maintenance including equipment, personnel, training, and monitoring costs.***

#### **Conclusions**

The rationale for the implementation of AED programmes is based on the evidence that an improvement in survival after cardiac arrest can be obtained by reducing the time to defibrillation. The joint ESC/ERC Policy Conference has been an important step to set out the key elements for a European action plan that should be promoted by ESC and ERC and should seek comprehensive involvement by all of the stakeholders.

We have identified priorities and needs for the achievement of better outcome for victims of cardiac arrest:

- AED programmes within EMS systems and improved access to the EMS are fundamental priorities that should be achieved before taking defibrillation outside the EMS. Priorities for the implementation of AED programmes should stem from EMS and hospital programmes and progressively move to community, on-site, and home programmes.
- Common standards for defibrillation within EMS should be set for European Countries and the 112 emergency number to access EMS across Europe should be implemented.
- The first requirement for the development of community, on-site, and home defibrillation programmes is the introduction of legislation in all European countries to permit defibrillation by non-medical personnel.
- Training requirements should be defined for individuals participating in a community defibrillation scheme. Common European standards for training, qualification of trainers, and monitoring of training programmes is an ideal that should be pursued. Research is needed to define the optimal integration of CPR and AED training for community, on-site, and home AED programmes.
- A basic set of criteria for the design of AED programmes has been outlined that include assessment of needs, expected benefit, and cost of each AED programme.
- A set of common definitions should be used (Utstein; see Section 4 in the on-line Appendix [www.escardio.org](http://www.escardio.org) and [www.erc.edu](http://www.erc.edu)) and systematic data collection and data analysis should be incorporated in each

programme in order to facilitate comparison of results from the different programmes.

- As a pivotal step to ensure the success of the plan all stakeholders should be involved from the outset. The community, the patients, and the medical professionals represent key players in supporting and facilitating the implementation of AED programmes, scientific societies such as the ESC and the ERC should support AED programmes by promoting education in the community, among the patients and their families, and among relevant medical societies and physicians with a responsibility for resuscitation.
- The Panel advocates support from the ESC and the ERC to involve Ministers of Health and the European Parliament in the promotion of a "European Cardiac Arrest Survival Directive".

## Participants

Participant to ESC-ERC policy conference were (by role and alphabetic order):

Speakers and Chairmen — Hans R. Arntz, Thomas Aufderheide, Michael Baubin, Lance Becker, Leo Bossaert, Tom Bowker, Neil Bradbury, Josep Brugada, Alessandro Capucci, Douglas Chamberlain, Stuart Cobbe, Michael Colquhoun, Sian Davies, Francisco De Latorre, Johan Hertz, Helmut Klein, Rodolph Koster, Markku Kuisma, Koen Monsieurs, Silvia G Priori, Miguel Ruano, Peter J Schwartz, Panos Vardas, Hein H Wellens, Lars Wik, David Zideman. Discussants — Jennifer Adgey, Aris Anastasakys, Helen Askitopoulou, Jan Bahr, Jean-Pierre Bassand, Antonio Bayes de Luna, Andrej Brucan, Pascal Cassan, Agah Certug, Johannes De Munter, Wiebe De Vries, Alessandro Del Bufalo, Csaba Dioszeghy, Daniel Ferreira, Michael Fiek, Aleksander Gorecki, Anton Gorgels, Anthony Handley, Stig Holmberg, Freddy Lippert, Carina Blomstrom-Lundqvist, Andrew Marsden, Romano Mauri, Carlo Napolitano, Ali Oto, Katherine Peel, Maurizio Raimondi, Maurizio Santomauro, Tom Silvast, Andrew Thornton, Anouk Van Alem, Benno Wolcke, Christian Wolpert. Industry representatives — Mathieu Badard, Martine Forissier, Robert Henderikx, Kathleen Higgs, Kurt Lemvig, Pascal Lesselingue, Ken Morallee, Robert Niskanen, Jo Frederik Ranhoff, Oern Stuge, Hilmar Wolff.

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