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UCD School of Medicine & Medical Science
Centre for Immediate Care Services

Advisory

External Defibrillator

Pre-Hospital Emergency Care Council

National Pre-Hospital Standards 2008

ADVISORY EXTERNAL DEFIBRILLATOR

NATIONAL PRE-HOSPITAL STANDARDS 2008

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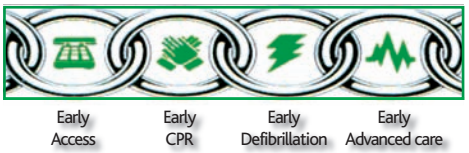
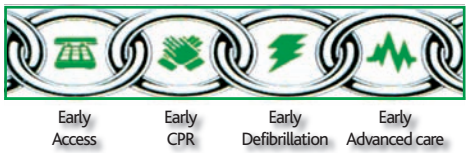
February 2008




Early Access
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Early Advanced care

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INTRODUCTION

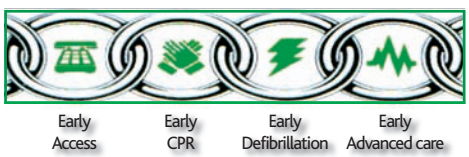
In March 2006 the Report of the Task Force on Sudden Cardiac Death, "Reducing the Risk: A Strategic Approach", was published by the Department of Health and Children[i]. The Report examines the causes of sudden cardiac death in Ireland and devises a strategy to reduce the number of events. Its recommendations cover a wide range of prevention, treatment and organisational issues. In particular, the Task Force Report emphasises the importance of early access to defibrillation, together with appropriately trained and supported carers.

In Ireland, The Pre-Hospital Emergency Care Council (PHECC) has a statutory responsibility for standards and training in pre-hospital emergency care. PHECC has identified the need for information and guidelines to be available to anyone considering the purchase of an Advisory External Defibrillator (AED) for use in the community. PHECC therefore invited the Centre for Immediate Care Services, UCD, to develop standards for potential purchasers of an AED. A working group was established with extensive clinical, technical and procedural expertise to develop these Standards. The Standards comprise one part of a broader strategy being developed by the Health Service Executive to implement the recommendations of the Task Force and are not therefore intended to address issues other than how to select the right AED for your needs. Please let us know how useful these Standards are and how they may be improved.

I am extremely grateful to the members of the Working Group and consultation groups for their expert contributions to this document and to Ms Mairéad Egan for her work in chairing the process and writing the Standards. In particular, I wish to also acknowledge the contribution of Ms Mary O'Brien, Community Resuscitation Training Officer, North Tipperary/East Limerick and Mr Richard Shannon, Advanced Paramedic, Eastern Regional Ambulance Service.

I hope we will be able to draw on their expertise in the further development of this document. The process of developing Standards such as these is never complete and I hope that with experience of their use, further editions of this document will maintain their relevance and usefulness.

Professor Gerard Bury
Director, UCD Centre for Immediate Care Services



ACKNOWLEDGEMENTS

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Contributors

A number of other individuals and equipment suppliers contributed to the development of this document. They are listed in section 6.

Pre-Hospital Emergency Care Council

This project was initiated and part-funded by the Pre-Hospital Emergency Care Council

Early Access Early CPR Early Defibrillation Early Advanced care

1 TRAINING AND ORGANISATION

Sudden Cardiac Death accounts for up to 5,000 deaths in Ireland each year; coronary artery disease leading to ventricular fibrillation is by far the most common reason for these deaths[i]. Good evidence exists that the Chain of Survival concept (Early Call for Help, Early CPR, Early Defibrillation and Early Advanced Life Support) will prevent some of these deaths[iii]. The Chain of Survival provides the framework for the proper management of these events at all levels of health care from first aid providers to complex medical response systems.

Defibrillation is a key aspect of the Chain of Survival. These Standards provide a wide range of potential users of AEDs with sufficient information to begin the process of selecting the right AED for their needs. However, the Standards do not address the broader issue of implementing the Chain of Survival at each of these levels. Providers must select the right type of training and organisational structure for their own needs. Many agencies and models of training and organisation are available and these Standards do not address them individually.

In 2006, the Pre-Hospital Emergency Care Council approved a Cardiac First Response (CFR) Standard for BLS/AED training (a notional six to eight hours training)[ii]. It is envisaged that by 2009 the PHECC CFR Standard will become the convention nationally for entry-level emergency cardiac care.

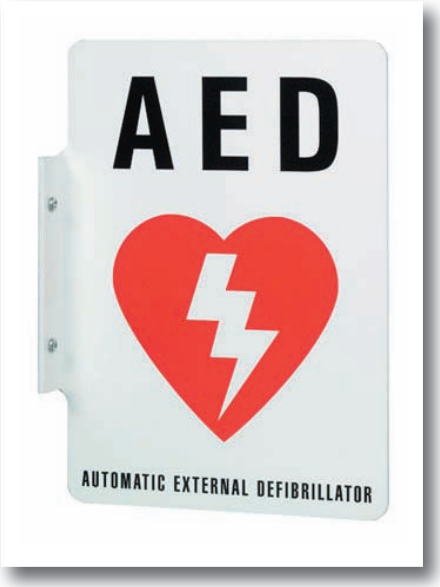
- The PHECC CFR Standard is based on the current International Liaison Committee On Resuscitation (ILCOR) Guidelines[iii], BLS and AED courses based on American Heart Association (AHA) or European Resuscitation Council (ERC) Standards are consistent with ILCOR Guidelines and can be adapted to meet the PHECC CFR Standard with some additions:

  - Aspirin administration for cardiac chest pain
  - Critical incident stress management
  - Clinical indemnity matters
  - Team concept
  - Handover and documentation
  - Infection prevention and control

- The Health and Safety Authority (HSA) has incorporated the PHECC CFR Standard in its Occupational First Aid Standard 2007.

- The Ambulance Services as (statutory, auxiliary, voluntary and private) are incorporating the PHECC CFR Standard.

- PHECC is engaging with the Irish Heart Foundation (IHF), which currently trains to AHA Standards and the Irish Water Safety (IWS), which currently trains to ERC Standards, about adopting the PHECC CFR Standard.



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The PHECC CFR Standard is a component of a comprehensive framework of standards designed to facilitate consistent and good quality pre-hospital emergency care across Ireland.

The PHECC Standards are built on a framework of six levels of care provision (Table 1). These headings are used throughout these Standards to indicate the specific features relevant to each category of user.

TABLE 1: PHECC PRE-HOSPITAL CARER CATEGORIES [II]

CATEGORY		DEFINITION	EXAMPLE
1.1	Cardiac First Responder	Volunteer	Community group
1.2	Emergency First Responder	Usually a volunteer	Voluntary first aid organisation
1.3	Emergency Medical Technician	Professional role	HSE Ambulance Service
1.4	Paramedic	Professional role	HSE Ambulance Service/Dublin Fire Brigade
1.5	Advanced Paramedic	Professional role	HSE Ambulance Service / Dublin Fire Brigade
1.6	Registered Medical Practitioner	Registered Medical Practitioner	General Practitioner

2 DEVELOPING THE STANDARDS

The Standards were developed as a three-part process:

(a) Criteria developed

The Working Group developed a range of criteria that could be considered in the process of acquiring an AED. These included broad headings such as purchasing and training and more detailed subheadings such as individual technical features. These criteria drew on current resuscitation guidelines, the relevant scientific literature and the experience and views of the members of the group. The PHECC Carer Categories were then applied to the list of headings and subheadings in order to develop a matrix for consultation purposes.

(b) Consultation process

The consultation process was carried out by inviting 89 individuals in Ireland who are acknowledged as expert in their areas of pre-hospital emergency care to comment on the criteria (general practitioners, ambulance service staff, nurses, community first responders and others). Participants were invited to comment on their own category of carer or a lower one. Two types of comment were invited:

a. Are the headings and subheadings appropriate and are any changes needed?

b. Is the heading or sub-heading appropriate for each category of carer: Essential/ Recommended/Optional Not Recommended or Not Applicable?

Responses were received from 72 of the 89 invited to take part.

(c) Review

Following receipt of responses from the consultation process, the Working Group reviewed the submissions to establish if headings or subheadings required revision and to assess the recommendations for individual criteria in respect of categories of carer.

- If a specific recommendation was made by more than 60% of respondents, it was accepted (the vast majority of items);
- If a recommendation was made by 50-60% of participants, it was reviewed by the Working Group and in almost all cases, the majority view was accepted (less than 10% of all items);
- If a recommendation was made by less than 50% of participants, it was reviewed by the Working Group and a decision made on the appropriate recommendation (a small number of items).

In a small number of Cases, the Working Group changed recommendations to maintain internal consistency – these are generally minor issues and include items such as adding a battery charger to a rechargeable battery in all categories of carer rather than just some categories.

3 HOW TO USE THE STANDARDS

Use of the Standards comes under two broad headings:

THE PURCHASING PROCESS

This section guides the purchaser through the various stages of the purchasing process:

Table 2: Thresholds recommended by the National Procurement Policy Unit (www.etenders.gov.ie)
Table 3: Suggested documentation to be requested from a supplier
Table 4: Cost considerations – AED
Table 5: Cost considerations - training and training supplies
Table 6: EU Directives/National Medical Device Requirements/considerations
Table 7: Environmental considerations
Table 8: After sales considerations
Table 9: After sales procedures

THE TECHNICAL SPECIFICATION

These deal with the differing needs of individual users. The technical specifications section is structured around the PHECC Carer Categories, which identifies six levels of user ranging from the community volunteer to a doctor (Table 1). For each category of user, technical aspects are identified as:

- E Essential
- R Recommended
- O Optional
- N Not recommended
- N/A Not applicable

Individual items and scores are included on the basis of consideration by the Working Group and the Consultation Groups.

We believe the content of the Standards is comprehensive and balanced. Nonetheless, the choice of which AED is most suitable for a particular community, agency or family must be made by that group taking into account their individual circumstances and needs.

4 THE PURCHASING PROCESS

If a community, voluntary or private group is purchasing an AED it is advisable to consult with the local HSE Ambulance Service. While the Ambulance Service will not recommend a particular product, they will indicate which types are compatible with equipment used by the statutory services in the area.

It is useful to ask potential suppliers to give a demonstration of the units being considered – a brochure is a poor substitute for trying out the unit!

Depending on the number of units required, purpose and available funds, potential purchasers of AED's may wish to set up a bidding or tender process among suppliers. Table 2 summarises the procedures currently used by a number of relevant agencies and may provide a useful guide for agencies or groups who do not currently have such a policy.

Where reference is made in this document to any particular make, source, origin, patent, process, trademark, brand name or standard, such reference shall on every occasion be interpreted as including the words "or equivalent". These references are provided only where it is not otherwise possible for a sufficiently precise description to be defined.

Organisations that are subject to National and EU Public Procurement rules are advised to consult the 2004 Public Procurement Guidelines published by the National Public Procurement Policy Unit (Department of Finance, Ireland). These can be downloaded from www.etenders.gov.ie. They recommend the following quotation/tender thresholds:

Table 2: Thresholds recommended by the National Procurement Policy Unit

Expenditure Levels (Exclusive of VAT)		Purchase Procedure
2.1	Less than €5,000	Obtain verbal quotes from competitive supplier(s)
2.2	€5,000 to €50,000	Seek written quotes from a minimum of three suppliers
2.3	€50,000 to EU threshold (The EU threshold is revised by the EU Commission every two years and different figures apply to different types of organisations)	Run a formal competitive tender which is advertised at www.etenders.gov.ie
2.4	Over EU threshold	A formal EU tender is required which is advertised at www.etenders.gov.ie and in the EU Journal at www.ted.europa.eu

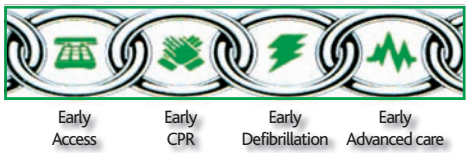


Table 3: Suggested documentation to be requested from a supplier

3.1	Evidence of a third party attested Quality Management System e.g. ISO 9000 or international equivalent
3.2	Valid Tax Clearance Certificate
3.3	Summary financial accounts for the previous three years
3.4	Current banker's reference
3.5	List of sites where same AED has been provided
3.6	Evidence of relevant insurance cover e.g. Product/Public Liability, Employer's Liability

Table 4: Cost considerations - AED

4.1	Unit cost
4.2	Discount for multiple units
4.3	One or two sets of adult pads
4.4	One or two sets of paediatric pads (where AED has paediatric facility)
4.5	Infrared (IR) or memory card or cable transfer facility to PC
4.6	Memory card reader, if applicable
4.7	Software programme for reviewing events
4.8	ECG cable
4.9	ECG electrodes
4.10	Spare pads
4.11	Battery / spare battery
4.12	Battery charger
4.13	Carrying case
4.14	Wall-mountable box
4.15	Wall-mounted sign
4.16	Supplies such as disposable face mask, scissors, gloves, razor etc.

Table 5: Cost considerations – Training and Training Supplies	
5.1	Training model AED
5.2	Mannequins
5.3	Training battery
5.4	Training battery charger
5.5	Initial training and refresher courses

Table 6: EU Directives/National Medical Device requirements/recommendations	
6.1	CE Mark for AED
6.2	CE Mark for all items of ancillary equipment
6.3	Safety - IEC 60601/EN 60601-1 Electrical
6.4	Safety - IEC 60601-2-4 Medical Equipment Std Part 2-4
6.5	Health Technology Assessment Report should be available and generally positive
6.6	Manufacturer/supplier should have post marketing surveillance/vigilance in place
6.7	Manufacturer/supplier should demonstrate that processes and personnel are in place to investigate reported problems / adverse events and must be willing to follow-up on reported problems and resulting investigations with users
6.8	Manufacturer / supplier must provide complete reports and analysis relating to device investigations after adverse events

Notes on Table 6

- All AEDs must carry a CE mark, as they are class 11B medical devices
- A CE mark demonstrates that the device is deemed to meet the essential requirements of the EU Medical Devices Directive (93/42/EEC) and generally implies that relevant international standards have all been met e.g. ISO60601
- A CE mark indicates that general safety and performance criteria have been met
- Health Technology Assessments (HTAs) are conducted by organisations independent of device manufacturers and assess specific devices, their features and performance and often compare devices to other devices. Internet searches can be used to find HTAs for specific AEDs but their independence and validity should be checked

- Adverse events in which the device has not performed as intended or concern is raised about the performance of the device should be reported by the user directly to the Medical Devices Department of the Irish Medicines Board (IMB) who will endeavour to ensure that the manufacturer conducts an appropriate investigation to determine cause and ensure any device problems are corrected (phone 01-6764971)
- Adverse events in which the device has not performed as intended or concern is raised about the performance of the device should also be reported to the device manufacturer
- Guidelines on medical devices legislation define adverse events as "Any malfunction or deterioration in the characteristics and/or performance of a device, as well as any inadequacy in the labelling or the instructions for use which, directly or indirectly, might lead to or might have led to the death of a patient, or USER or of other persons or to a serious deterioration in their state of health"
- The manufacturer is obliged to investigate reports of incidents or near incidents and inform the IMB accordingly
- An online reporting system is in place to facilitate this process and can be found in the Medical Devices sections of the IMB website (www.imb.ie)
- Further information on the reporting of incidents is available in IMB Medical Device Guidance Notes 7 and 13 which are also available on the IMB website

Table 7: Environmental Considerations

7.1	Shock/drop abuse tolerance - MIL-STD 810E / F
7.2	Motion detector/vibration - MIL-STD 810E / F
7.3	Rated for dust protection – IEC 60529 / EN 60529 - IP5X
7.4	Rated for water protection - IEC 60529 / EN 60529 - IPX4
7.5	Specified operating temperature and humidity parameters
7.6	Specified standby temperature and humidity parameters of unit with batteries installed
7.7	Recommended separation distances between AED and mobile communications equipment specified
7.8	Internal clock always on real time or adjustable to reflect real time
7.9	Policy/facility for disposing/recycling of AED and AED trainer
7.10	Policy/facility for disposing/recycling of time expired battery
7.11	Policy/facility for disposal of time expired and used pads

Table 8: After sales considerations

8.1	Duration of warranty
8.2	On-site or next day replacement
8.3	Cost of future software upgrades
8.4	Availability of on-site software upgrades
8.5	Off-site software upgrades - within Ireland
8.6	Off-site software upgrades - outside Ireland
8.7	Maintenance – check if and when a technical safety inspection is required
8.8	Lead time for replacement pads
8.9	Lead time for replacement batteries

Table 9: After sales procedures

9.1	Complete relevant warranty cards
9.2	Follow maintenance guidelines as specified by manufacturer
9.3	Maintain record of expiry dates of batteries and pads
9.4	Maintain record of all AED events
9.5	Maintain record of all training activity and expiry date of certification
9.6	Arrange training or retraining when appropriate
9.7	Arrange daily or periodic checklist for device and supplies
9.8	Notify Ambulance Service of the presence of unit, if applicable
9.9	User should participate in any registration schemes
9.10	User should report adverse events directly to Irish Medicines Board
9.11	User should report adverse events directly to manufacturer

5 THE TECHNICAL SPECIFICATION

This section provides guidelines under several technical headings and should assist with choosing the correct type of unit for a particular user group.

Please refer to Table 1 PHECC Pre-Hospital Carer Categories for a description of the various grades of AED user.

TABLE 10: Key to Status Indicators

E	Essential	This feature is considered to be an essential component/feature which is appropriate to the specific category of user
R	Recommended	This feature is recommended as being appropriate to the category of user
O	Optional	This feature should be at the discretion of purchaser/user
N	Not recommended	This feature is considered inappropriate for the category of user
N/A	Not applicable	This feature is considered not applicable to the category of user

A	NOMINAL SPECIFICATION	NOTE	GP	AP	P	EMT	EFR	CFR
A1	Easily identifiable as AED	To provide prompt access to AED	E	E	E	E	E	E
A2	Portable	To facilitate transporting AED to/from various locations	E	E	E	E	E	E
A3	Wall-mountable with alarm	Visible and accessible where the risk of vandalism or theft is high	O	N	N	O	O	O
A4	Wall-mountable without alarm	Visible and accessible where the risk of vandalism or theft is low	O	N	N	O	O	O
A5	Carrying case appropriate for environment	To protect AED from weather damage	E	E	E	E	E	E
A6	Instruction manual – hard copy plus optional CD/DVD	Full user instructions as part of AED training	E	E	E	E	E	E
A7	Abbreviated operating instructions included on or with AED (e.g. laminated card attached to AED)	Summary user instructions on opening AED	E	O	R	E	E	E
A8	Push button operation	Clear, concise and unambiguous procedures	E	E	E	E	E	E
A9	Automated self test	To check AED readiness for operation	E	E	E	E	E	E
A10	AED readiness indicator	To confirm at a glance that AED is ready for use	E	E	E	E	E	E
A11	Visual warning alarm if self tests fail	To alert user to rectify AED problem	E	E	E	E	E	E
A12	Audible warning alarm if self tests fail	To alert user to rectify AED problem	E	E	E	E	E	E
A13	Battery status indicator or low battery alert	To alert user when battery needs to be replaced	E	E	E	E	E	E
A14	Audio prompts	To ensure user has clear instructions	E	E	E	E	E	E
A15	Volume adjustable (however, it is recommended that AED's be pre-set to maximum volume)	To facilitate AED use in noisy environment or for users with hearing impairment	R	R	R	R	R	R
A16	Visual prompts	To activate at a key intervention time	E	O	E	E	E	E
A17	High resolution screen	Displays written instructions to guide user through rescue	R	E	E	E	N	N
A18	Shock counter display	To display number of shocks delivered	E	E	E	E	E	E
A19	All cables easy to connect /disconnect from AED, but sufficiently protected from accidental disconnection/ misconnection	Durable cable connection will minimise damage from use	E	E	E	E	E	E

B	TECHNICAL SPECIFICATION	NOTE	GP	AP	P	EMT	EFR	CF
B1	Operation – Automatic	AED can shock a suitable rhythm without user intervention	N	N	N	N	N	N
B2	Operation - Semi-Automatic (Advisory)	AED will analyse rhythm and prompt user to press 'shock' button	R	E	E	E	E	E
B3	Manual override included	To allow user to switch to 'manual' mode to access certain features appropriate to his/her capability and training	O	E	O	N	N	N
B4	Password for manual override	To ensure that 'manual' mode is not accessed inappropriately	O	O	O	N	N	N
B5	Biphasic technology	Physiologically more appropriate than monophasic technology	E	E	E	E	E	E
B6	Time from analysis to shock advised <10 seconds	To minimise interval between rhythm analysis and shock delivery	E	E	E	E	E	E
B7	Time from shock advised to armed <5 seconds	To minimise interval between rhythm analysis and shock delivery	E	E	E	E	E	E
B8	Ability to give CPR during charging (when technology becomes available)	To allow uninterrupted delivery of CPR during charging	R	R	R	R	R	R
B9	Internal memory for event review, number of shocks etc.	To facilitate audit and review of event	E	E	E	E	E	E
B10	Currently configured for 2005 ILCOR Guidelines	To ensure AED programmed to current international Guidelines	E	E	E	E	E	E
B11	Configurable to any future ILCOR Guidelines	To ensure AED will not become obsolete if Guidelines change	E	E	E	E	E	E
B12	Internal safety discharge (if shock cannot be delivered)	To ensure safe discharge of shock if for any reason the shock is not delivered to patient	E	E	E	E	E	E
B13	Push button analysis prompt	Rhythm analysed when user presses button	O	O	O	N	N	N
B14	Automatic analysis prompt	Rhythm analysed without user intervention	O	O	O	E	E	E

C	ALL BATTERIES	NOTE	GP	AP	P	EMT	EFR	CFR
C1	Shelf life prior to installation specified (when stored under standby environmental conditions)	To allow user to plan replacement battery	E	E	E	E	E	E
C2	Standby life specified (when stored under standby environmental conditions)	To allow user to plan replacement battery	E	E	E	E	E	E
C3	Number of shocks/ monitoring minutes deliverable from fully charged battery on installation specified	To monitor battery usage and life	E	E	E	E	E	E
C4	Minimum number of shocks/monitoring minutes deliverable after 'low battery' warning specified	To monitor battery usage and life	E	E	E	E	E	E
C5	Battery storage temperature parameters specified	Battery may not operate if stored outside specified temperature parameters	R	R	R	R	R	R
C6	State if charge time increased near end of battery service life	To prompt user to monitor battery life	R	R	R	R	R	R

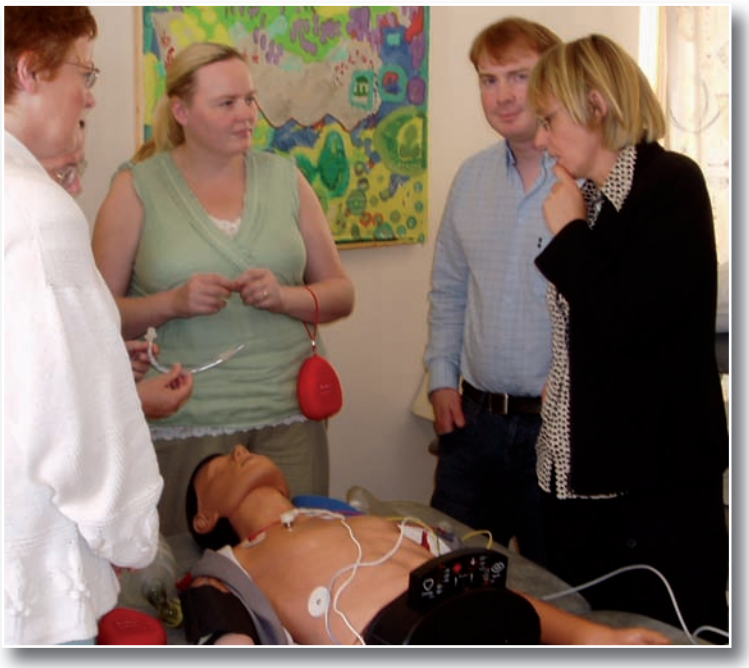
D	BATTERY: DISPOSABLE	NOTE	GP	AP	P	EMT	EFR	CFR
D1	Disposable battery (battery must be changed if capacity depleted or battery is time–expired)	Guarantees delivery of a set number of shocks or monitoring time without risk of battery damage through frequent charging	O	N	N	O	E	E
D2	Number of shocks deliverable from disposable battery specified	To prompt user when battery needs replacing	E	E	E	E	E	E
D3	Spare disposable battery/batteries	To allow user time to replace a used battery	E	E	E	E	E	E

E	BATTERY: RECHARGEABLE	NOTE	GP	AP	P	EMT	EFR	CFR
E1	Rechargeable battery with charger	Battery can be recharged when capacity depleted	O	E	E	O	N	N
E2	Number of shocks/ monitoring minutes deliverable from rechargeable battery specified	To prompt user when battery needs to be recharged	E	E	E	E	E	E
E3	Battery need not be empty prior to recharging	Battery charge can be 'topped up' at any time	R	R	R	R	N	N

Notes on Rechargeable Batteries

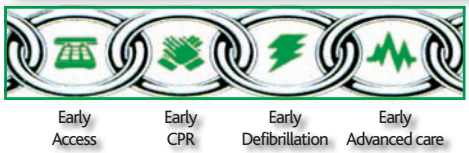
Where services are using monitors/AED's on a continuous basis, rechargeable batteries make economic sense. It is important though that batteries are managed carefully to avoid development of 'memory' – the phenomenon whereby the battery will operate for only short periods of time. Some manufacturers have a built-in battery conditioning system and this can extend the lifetime of usage to approximately five-years.

Where rechargeable batteries are used: Each battery should have a unique easily identifiable number (to identify a problem battery), and a system for management guided by the manufacturer. Sufficient spare batteries should be built into this system to allow for the capacity of usage within that service.



F	DISPOSABLE DEFIBRILLATION PADS	NOTE	GP	AP	P	EMT	EFR	CFR
F1	Instructions on pads for correct positioning	To ensure correct positioning first time	E	R	R	E	E	E
F2	Recommended pad life of 12-24 months from delivery date	To avoid frequent pad replacement	E	E	E	E	E	E
F3	Surface area of pads specified (AHA Guidelines)	To maximise defibrillation success	E	E	E	E	E	E
F4	Pads pre-connected to AED	To save time on opening AED; also allows user to ensure compatibility of pads and AED	O	R	R	R	R	R
F5	Adult pads clearly marked	To differentiate from paediatric pads	E	E	E	E	E	E
F6	Paediatric pads clearly marked	To differentiate from adult pads	E	E	E	E	E	E
F7	Pad adaptor to make compatible with AS AED's	To facilitate smooth hand-over of patient to AS	R	R	R	R	R	R
F8	Spare set of pads	To allow time to replace used pads	E	E	E	E	E	E
F9	Non-polarised pads	Either pad can be placed in apex/sternal position	R	R	R	R	R	R
F10	Temperature/humidity parameters specified	Pads may freeze at certain temperatures that might affect their efficacy	R	R	R	R	E	E

G	PAEDIATRIC DEFIBRILLATION	NOTE	GP	AP	P	EMT	EFR	CFR
G1	AED has paediatric defibrillation facility	For use on children aged 1 to 8 years	O	E	E	R	N	N
G2	AED adaptable to appropriate energy levels for children 1 to 8 years	To differentiate from energy levels for adults	E	E	E	E	NA	NA
G3	Specified age and/or weight parameters for children	To maximise defibrillation success and reduce shock toxicity	E	E	E	E	NA	NA
G4	Paediatric pads clearly marked	To differentiate from adult pads	E	E	E	E	NA	NA
G5	Pad placement instructions for children specified	To differentiate from placement of adult pads	E	E	E	E	NA	NA



Notes on Paediatric Defibrillation

Paediatric defibrillation in AED mode refers to children aged between 1-8 years of age. Currently there is insufficient data to make a recommendation for or against the use of AEDs for infants aged less than one year [iv, v]. The risk of ventricular fibrillation during infancy is unknown.

Most cardiac arrests in children are thought to result from respiratory failure or shock rather than from a shockable arrhythmia. As a result there is concern that repeated interruption of CPR to try to detect and treat a rhythm uncommon in that age group may introduce more risk than benefit [iv].

If manual mode is used the recommended manual defibrillation doses are 2J/kg for the first attempt and 4 J/kg for subsequent attempts [vi].

Given the limited evidence base for paediatric defibrillation and the considerable potential for associated risks and costs, the Working Group has not recommended the inclusion of a paediatric defibrillation capacity on a routine basis. In certain circumstances, individual providers or services may view this as an important capacity and may then decide on its inclusion.

H	MEMORY/DATA TRANSFER FACILITY	NOTE	GP	AP	P	EMT	EFR	CFR
H1	AED has specified memory facility (memory card or internal memory)	To record monitoring or cardiac arrest events	E	E	E	E	E	E
H2	Memory capacity specified	To ensure sufficient capacity to save events	E	E	E	E	E	E
H3	Infrared (IR) or memory card or cable transfer facility to PC	Optional data transfer facilities	E	E	E	E	E	E
H4	Memory card reader, if applicable	Device adapter to facilitate reading memory card	E	E	E	E	E	E
H5	Event and ECG data review download system available	To allow user to review event on PC	E	E	E	E	E	E
H6	Software can be used on multiple platforms	e.g. Windows Vista or future upgrades	R	R	R	R	R	R
H7	Patient data and ECG can be printed locally	To provide hard copy of event to facilitate review	R	E	E	R	R	R

J	ADVANCED FUNCTIONS (INTEGRATED)	NOTE	GP	AP	P	EMT	EFR	CFR
J1	ECG Monitoring Screen with appropriate leads and electrodes	To view rhythm during management of patient	E	E	E	O	N	N
J2	Twelve lead ECG capability	To allow ECG interpretation	O	E	R	N	N	N
J3	Twelve lead ECG data transfer capability	To facilitate review	O	E	R	N	N	N
J4	ECG interpretative software	To facilitate review	O	O	O	N	N	N
J5	Pulse oximetry	To monitor oxygenation of patient's blood	O	O	O	O	N	N
J6	BP monitor	To monitor patient's blood pressure	O	O	O	O	N	N
J7	Capnography	Monitoring of concentration or partial pressure of CO2 in respiratory gases	O	O	O	N	N	N
J8	Synchronised cardioversion	Process by which an abnormally fast heart rate or cardiac arrhythmia is terminated by the delivery of a therapeutic dose of electrical current to the heart at a specific moment in the cardiac cycle	O	O	N	N	N	N
J9	Transcutaneous pacing	A temporary means of pacing patient's heart during a medical emergency	O	O	N	N	N	N

K	AED TRAINING UNIT	NOTE	GP	AP	P	EMT	EFR	CFR
K1	AED trainer easily identified as same	To differentiate from a unit that can deliver a shock	E	NA	NA	E	E	E
K2	AED trainer with disposable batteries (e.g. Size D)	Not rechargeable	O	NA	NA	R	R	R
K3	AED trainer with rechargeable battery	Provides longer life than disposable battery	O	NA	NA	O	O	O
K4	Rechargeable training battery (with charger) to convert AED to training model	For frequent training	O	NA	NA	N	N	O
K5	Training scenarios built into battery	To allow teaching of pre-determined scenarios	R	NA	NA	R	R	O
K6	Training scenario override on battery	To allow trainer to determine his/her own scenarios	O	NA	NA	O	O	O

Notes on the AED Training Unit

Most Ambulance Services use a fully functioning monitor/AED attached to an arrhythmia generator when training Paramedics and Advanced Paramedics. This gives the active learner the full functionality and experience of the device in a staged, controlled training scenario. These functionalities are not required of other pre-hospital levels.

The Working Group recommends that Ambulance Services and Paramedic/Advanced Paramedic training institutions should continue to use a fully functioning AED when training Paramedics/Advanced Paramedics to maximise the learning outcome.

In other Carer Categories, the maximum benefits and lowest costs are likely to be attained by using an AED trainer in place of a fully functioning AED.

L	ACCESSORIES	NOTE	GP	AP	P	EMT	EFR	CFR
L1	Shears for cutting clothing	To provide access to patient's bare chest	E	E	E	E	E	E
L2	Disposable face mask	To facilitate CPR	E	E	E	E	E	E
L3	Disposable face mask with oxygen inlet	For simultaneous CPR and oxygen administration	E	R	R	R	E	E
L4	Wall mounted sign to indicate location of AED	To readily identify AED in public access areas	O	N	N	N	E	E

M	DEVELOPING TECHNOLOGIES	NOTE	GP	AP	P	EMT	EFR	CFR
M1	Feedback on CPR quality	Improves CPR quality	R	R	R	R	N	N
M2	Ability to detect pacemaker	Potentially improves accuracy of diagnosis	R	R	R	R	R	R
M3	Rhythm analysis during CPR	Potentially identifies a shockable rhythm earlier	R	R	R	R	R	R
M4	Biphasic Truncated Exponential versus Rectilinear waveforms	Currently depends on individual manufacturers recommendations						
M5	Synchronisation of shocks for pulseless ventricular tachycardia							
M6	Escalating versus fixed energy doses							

Notes on Developing Technologies

- A number of emerging issues have been explored with industry.
- Some reflect widely accepted issues such as feedback on CPR quality, which may be of benefit to those who can invest in the training needed.
- Other features have little or no current published evidence and may offer undefined or future benefits.
- An example is the fact that individual manufacturers use varying electrical waveforms and energy levels and it is not currently possible to advise on the choice of one over another.

6 CONTRIBUTORS

The following contributed to the development of this document. In addition, manufacturers, suppliers and distributors of AED's responded to specific questions regarding some technical aspects of their equipment. It would be unfair to list such a group; however the Steering Committee are very much appreciative of the contribution made by this group.

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7 REFERENCES

i Department of Health and Children (2006) *Reducing the Risk: A Strategic Approach. Report of the Task Force on Sudden Cardiac Death*
http://www.dohc.ie/publications/sudden_cardiac_death.html

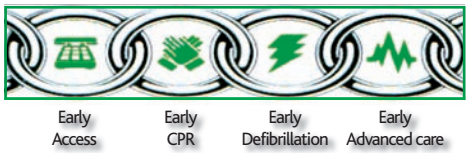
ii Pre-Hospital Emergency Care Council
http://www.phecc.ie

iii International Liaison Committee on Resuscitation (ILCOR)
http://www.erc.edu/index.php/ilcor

iv *The European Resuscitation Council Guidelines for Resuscitation* (2005)
http://www.erc.edu

v American Heart Association CPR ECC 2005
http://www.americanheart.org

vi Pre-Hospital Emergency Care Council, *PHECC Advanced Clinical Practice Guidelines for Registered Advanced Paramedics*, 2nd Edition, February 2007
http://www.phecc.ie


Early Access
Early CPR
Early Defibrillation
Early Advanced care