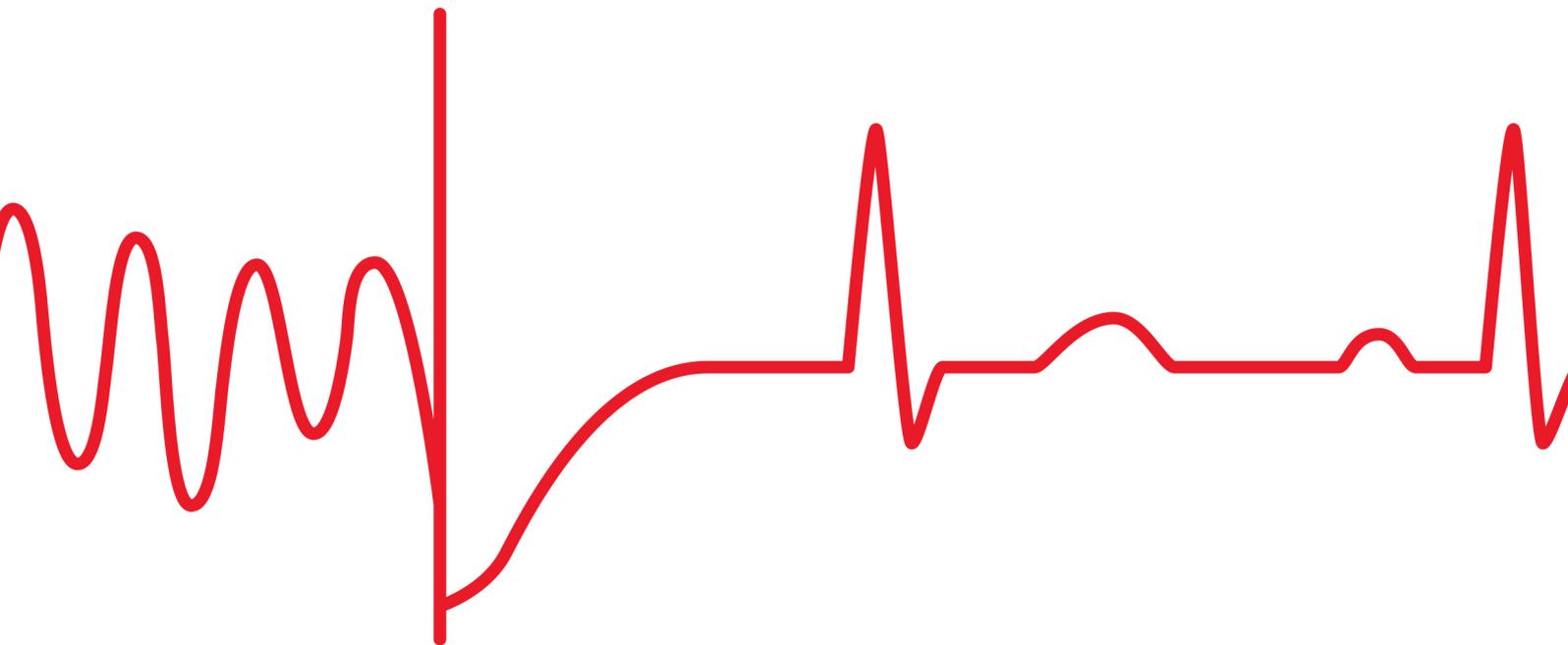


A guide to Automated External Defibrillators (AEDs)

by Resuscitation Council UK in collaboration with
British Heart Foundation
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This guide provides information about automated external defibrillators (AEDs) and how they can be used anywhere, by anyone, to try to save the life of a person who has a cardiac arrest.



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Endorsed by
National Ambulance Service Medical Directors Group



**ASSOCIATION OF
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1. Key points

- 1.1. Sudden cardiac arrest is a leading cause of premature death. In cardiac arrest the heart's steady rhythm is often replaced by disorganised electrical activity called ventricular fibrillation (VF). The sooner VF is treated by an electrical shock (defibrillation), the greater the chance of the person's life being saved. Immediate action by members of the public can save many lives.

For more information see [section 2](#).

- 1.2. Many people who collapse with cardiac arrest can be saved if people nearby:
- recognise what has happened
 - call for an emergency ambulance immediately
 - start and continue cardiopulmonary resuscitation (CPR) – especially chest compressions
 - use an AED to shock the heart back to its normal rhythm.

For more information see [section 2](#) and [section 3](#).

- 1.3. AEDs are compact, portable, easy to use, safe and very effective. They can be used by anyone, whether or not they have had formal training. An AED gives the person using it voice instructions. An AED will not allow a shock to be given unless the collapsed person needs one. AEDs can be stored for long periods without use and need very little maintenance.

For more information see [section 3](#) and [section 13](#).

- 1.4. AEDs have been placed in many busy public areas, workplaces, and other locations. The intention is that they will be used to restart the heart of a person in cardiac arrest as soon as possible. AEDs provided for use by members of the public are called public-access defibrillators (PADs).

AEDs can be used safely and successfully by people with no specific training. Untrained members of the public have saved lives in this way, so lack of training should not deter people from using an AED.

Familiarisation with AEDs is included in first aid and CPR training, as it gives people confidence to send someone to fetch an AED and to use it without delay.

For more information see [section 4](#), [section 8](#), [section 9](#) and [section 11](#).

- 1.5. In the United Kingdom, there are no legal restrictions to the use of an AED. A rescuer, whether a trained first aider or an untrained member of the public, who has acted to the best of their ability to help a person in cardiac arrest should not be sued, regardless of the outcome.

For more information see [section 6](#).

- 1.6. This guide lists important factors to be considered before installing an AED. Decisions should be made in partnership with the local ambulance service who will advise about AED purchase, installation and other practical information.

For more information see [section 5](#) and [section 7](#).

- 1.7. As they must be accessible without delay, AEDs should be placed where they are most likely to be needed, in a prominent position, with clear signs to direct people to them. Anyone working near an AED should be aware of it and its purpose and should be encouraged to be trained to know what to do if someone collapses. If the collapsed person is unresponsive and not breathing normally, this includes calling for an emergency ambulance, starting cardiopulmonary resuscitation (CPR) and sending someone to get the AED.

For more information see [section 5](#) and [section 12](#).

2. Background

Sudden cardiac arrest is an important cause of death in people of all ages. The risk of cardiac arrest increases with age. In Europe, around 1 person in 1,000 suffers cardiac arrest each year. In the UK, there are approximately 60,000 cardiac arrests annually. Resuscitation is attempted in only about half of these, but fewer than 1 in 10 survive.

What causes cardiac arrest?

Most cases of cardiac arrest are due to an abnormality of the heart's electrical rhythm called ventricular fibrillation (VF) in which the electrical signals that normally control the heartbeat become chaotic and uncoordinated. The heart stops beating and the circulation of blood around the body stops. Death is inevitable unless the condition is recognised promptly and defibrillation is carried out quickly. Defibrillation is the use of a defibrillator to deliver an electric shock that stops the chaotic rhythm of VF and allows the normal, organised, electrical rhythm of the heart to restart. This can allow the pumping action of the heart to return.

What influences survival from cardiac arrest?

The major factor limiting the number of people who survive cardiac arrest is the ability to provide defibrillation within a critical time. Conditions for defibrillation are only optimal during the first few minutes after the onset of VF, although this period can be extended if a bystander starts cardiopulmonary resuscitation (CPR), particularly chest compressions. For details about this see the [Adult basic life support and automated external defibrillation guidelines](#). The person's chance of survival decreases by around 10% with every minute that defibrillation is delayed. Only rarely is the ambulance service able to attend and provide defibrillation early enough, and the best way of ensuring prompt defibrillation is for someone nearby to use an AED to deliver the shock that may save a life.

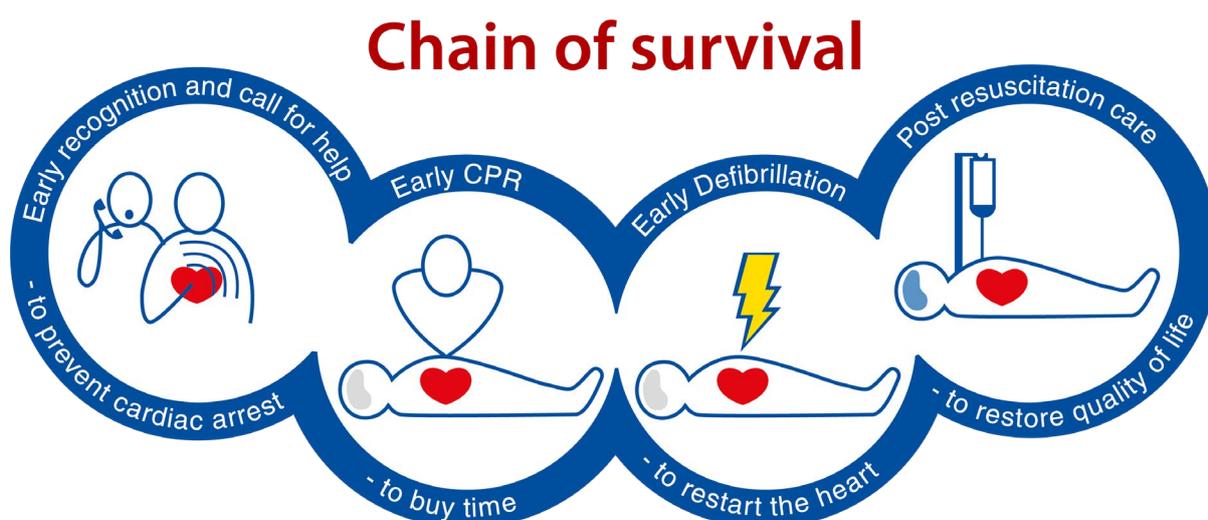


Figure 2.1 The chain of survival, emphasising the importance of recognising cardiac arrest, calling for help, starting CPR and using a defibrillator without delay.

Is cardiac arrest the same as a heart attack?

No. A 'heart attack' (myocardial infarction) occurs when an artery supplying the heart with blood becomes blocked. This blockage may initially cause chest pain and damage to some of the muscle of the heart. In some people, a heart attack may trigger a cardiac arrest. The potential risk of this happening emphasises the importance of summoning immediate help for anyone with a suspected heart attack, so that they can receive prompt treatment for their blocked artery and damaged heart muscle. This will reduce the risk of cardiac arrest. As soon as a heart attack is suspected, the nearest available AED should be brought to the scene as a precaution. Then, if the person does go on to suffer a cardiac arrest, the AED can be used without delay to maximise the chance of survival.

Are there other causes of cardiac arrest?

In some people, including some sports people and athletes, a defect in the heart's own electrical system may trigger the heart to develop VF and stop beating, causing cardiac arrest. This usually occurs without warning and is why many sports facilities and gyms have installed AEDs.

There are many other causes of cardiac arrest. It is usually not possible at the time of a cardiac arrest to be sure of its precise cause. The priority is to provide immediate treatment, as this is the same in the early stages, regardless of the cause. The Chain of Survival (Figure 2.1) is used to emphasise the sequence of urgent actions needed when someone collapses with a suspected cardiac arrest. The first three steps can all be done immediately by members of the public:

1. Call 999 (or 112) for an ambulance
2. Start CPR and continue this
3. Send someone to fetch an AED, attach its pads to the collapsed person, and follow its instructions.

3. Automated external defibrillators (AEDs)

An automated external defibrillator (AED) is a portable electronic machine (Figure 3.1) that can automatically detect the abnormal heart rhythms that cause cardiac arrest and can deliver the shock that is needed to save the life of a person with a rhythm such as VF.



Figure 3.1 An AED open and ready for use by following the simple verbal instructions that it gives you.

How would I use an AED effectively?

To use an AED safely and effectively, all you need to do is:

1. recognise that someone who has collapsed, is unresponsive and is not breathing normally is likely to have had a cardiac arrest
2. attach the two adhesive pads (electrodes) that connect the AED to the person's bare chest (Figure 3.2)
3. switch on the AED
4. follow the instructions given by the AED.

What does the AED actually do?

Through the pads the AED can monitor the heart's electrical rhythm and deliver a shock when it is needed. The AED gives voice instructions to tell you exactly what you should do. Visual prompts are also provided through simple diagrams on the AED or its case.



Figure 3.2 (a) AED adhesive pads (electrodes) placed on the chest of an adult – using full-size pads

Figure 3.2 (b) AED adhesive pads (electrodes) placed on the chest of a child – using paediatric pads

The AED will automatically analyse the heart's electrical rhythm and if it detects a life-threatening rhythm likely to respond to a shock, it will charge itself ready to deliver a shock. Some devices will then tell the operator not to touch the person and will deliver the shock automatically, without needing any further action by the rescuer. Others tell the rescuer not to touch the person and then to press a button to deliver the shock. The rescuer does not have to decide what to do – the AED will tell them. As soon as the shock has been delivered, the AED will tell the rescuers to give the person CPR. After a fixed period (two minutes), the AED will tell the rescuers not to touch the person while it rechecks the heart rhythm and, if it is needed, a further shock will be given. Using an AED in this way allows anyone to provide effective treatment during the critical first few minutes after cardiac arrest, while the emergency services are on their way.

Does everyone with cardiac arrest need defibrillation?

No. In some people with cardiac arrest, a shock is not needed because the heart is not in a rhythm that will respond to a shock. In that situation, the AED will announce that a shock is not needed and tell the rescuer to continue CPR. This does not mean that the AED isn't working properly, so continue to do what it tells you. Do not switch it off or detach it from the person. Modern AEDs are very reliable and will not allow a shock to be given unless it

is needed. Therefore, they are extremely unlikely to do any harm to a person who has collapsed. They are also safe and present no significant risk of a rescuer receiving a shock.

Does an AED need maintenance?

AEDs require hardly any routine maintenance or servicing. Most perform daily self-checks and display a warning if they need attention. Most AEDs currently offered for sale have a minimum life-expectancy of ten years. The batteries and pads have a long shelf-life, allowing the AED to be left unattended for long intervals between servicing. More details are given in [section 9](#).

All these features of AEDs make them suitable for use by members of the public, even with little or no training, and for use in community PAD schemes.

What else is needed when we install an AED?

As well as having an AED on site (and ideally, people familiar with when and how to use it) it is vital that as many people as possible learn how to give CPR. As described in [section 2](#), this entails:

- recognising that someone may have suffered cardiac arrest
- calling the emergency services (999 or 112) immediately
- then giving chest compressions and (if willing and able) rescue breaths.

This basic first aid will maintain an oxygen supply to the person's brain and heart and make it more likely that their heart can be restarted by defibrillation.

4. AED programmes and Public Access Defibrillator schemes

In the UK in 1999, the government-led '[Defibrillators in Public Places Initiative](#)' promoted the use of AEDs by people other than health professionals. AEDs were placed in railway stations, airports, and other public places where cardiac arrest occurred most frequently. Staff working at these sites were trained in CPR and AED use. This strategy was effective and saved many lives.

As AEDs became more readily available, similar schemes were introduced in the UK and across the world and expanded to promote AED use by members of the public.

In the UK, many AEDs have now been purchased by organisations, including charities, local communities, businesses and commercial companies, gyms, schools and dental surgeries. Some – but not all – of these AEDs are available for public access. Of those that are, many are not available 365 days per year and at all times of day or night, so do not provide the public with optimal access and the best chance of saving a life. As explained below ([section 5](#) and [section 12](#)), when buying one or more AEDs, consideration should be given to making them available 24/7 for full public access.

5. Considerations when buying an AED

When considering buying one or more AEDs, you should ask yourself several questions:

How likely is cardiac arrest in this location?

If cardiac arrest is a frequent occurrence, placing one or more AEDs here provides a good chance of it being used, and saving lives. Busy train and bus stations and airports are typical examples. Where these have a large area, it may be necessary to place several AEDs in strategic positions to provide rapid access when one is needed.

If cardiac arrest occurs, is rapid emergency-service access to this location difficult?

Even though cardiac arrest may be a relatively infrequent event, in many rural communities or workplaces with difficult access (likely to delay arrival), a local AED for use by those present may provide a person suffering cardiac arrest with the only realistic chance of survival. Provision of an AED on passenger aircraft is another example where survival from cardiac arrest is otherwise unlikely.

Do I/we have a statutory duty under the Health and Safety at Work Act 1974 and associated regulations?

There are no statutory laws relating to resuscitation or the provision of an AED. The Health and Safety Executive does not mandate that any employer or organisation must provide an AED.

Familiarisation and training in the use of an AED is now a core component of the HSE-recognised first aid at work course, so employees who undertake the course will be trained to use one, regardless of whether an AED is provided in their workplace. There may be potential consequences for some employers under common law if an AED is not

provided. For further information see the Resuscitation council UK's guide [CPR, AEDs and the law](#), pages 21–22.

Do I/we have a 'duty of care' to visitors to or users of my/our facilities?

This may be a consideration at some premises, for example dental practices, schools, sports facilities and gymnasias. Please see also [section 6](#).

What other considerations should be taken into account?

There are no generally agreed criteria on whether or not AEDs should be provided in specific places, but consideration of the following points may be helpful if you are making decisions about buying an AED, or planning an AED programme or PAD scheme:

- Cardiac arrest affects predominantly middle-aged and older people.
- Some younger people (including athletes, elite sportspeople and some children) suffer cardiac arrest or sudden cardiac death; although less common, this attracts understandable public attention.
- People with underlying heart disease are particularly vulnerable but, for some of these, cardiac arrest may be the first manifestation of their heart condition.
- The more people present in or passing through any one place the greater is the risk of cardiac arrest occurring there (see [Appendix B](#)).
- Cardiac arrest may occur during exertion. The stress of travel is also a recognised precipitant, but in many cases no trigger is identified.
- The purpose of setting up an AED programme or PAD scheme is to save lives.
- To save a person's life, an AED must be used to deliver a shock at the earliest possible moment after cardiac arrest – if possible, within 3–5 minutes – ideally even sooner.
- Any delay in fetching an AED or delay caused by having to get a code to open a locked AED cabinet will reduce the chance of saving a life (see [Appendix C](#)).
- Untrained members of the public have used AEDs successfully to save lives. PAD schemes should promote AED use by members of the public by placing them in prominent positions, displaying clear instructions (see [section 11](#)) and using direction signs to make sure that people can find them quickly (see [section 12](#)).
- In the past, many examples of successful AED use have involved people who had received some training (often only modest training) and who were nearby.
- When installing one or more AEDs it is important to promote training in CPR and familiarisation with AEDs among people on site who may be called on to use an AED.

This gives people confidence to respond quickly to cardiac arrest, start CPR and to use an AED.

- In a workplace, whilst there may be designated first-aiders who receive training in CPR and AED use, it is best to familiarise as many staff as possible with the use of an AED and encourage all staff to have training in CPR.
- They may get this from a training session, or by using an interactive app such as those developed by the Resuscitation council UK – [Lifesaver](#) and [Lifesaver VR](#).
- Performing good-quality CPR is a vital skill that increases survival from cardiac arrest and can buy time until an AED can be used.
- Staff who may be called on to attempt CPR or use an AED can be reassured that by trying to save a person's life they will not be subject to criticism or blame, and they should be protected by their Employer's Liability Insurance against litigation if the person does not recover. By using an AED, they cannot make the person's condition worse. An AED will discharge a shock only if the person has a heart rhythm that warrants a shock to try to save their life.
- After an AED has been used, information from its electronic memory should be downloaded to help with the person's further treatment. Whilst this will usually be done by the ambulance service immediately after the event, details of how this is done should be clarified when buying the AED.
- After use of an AED, it should be returned as soon as possible to its usual position, together with new adhesive pads (electrodes).
- Ambulance services cannot guarantee to respond immediately to an emergency call, even when it is given high priority. When they can respond promptly, it is not often that they can provide defibrillation within 3–5 minutes. Often, that can be achieved by a PAD scheme.

6. AEDs and the law

This topic is covered in detail in the Resuscitation council UK publication [CPR, AEDs and the law](#). Please refer to that document if the following summary points do not provide information that you need.

Could I be sued if I use an AED?

Some people are concerned that by trying to help a collapsed person they may do harm and have legal action taken against them. In the UK, the reality is that it is very unlikely

that a potential rescuer, acting within their knowledge and ability, would be sued. As national and international guidelines promote AED use by untrained members of the public, use of an AED could be regarded as being within the ability of most members of the public.

In the UK, there has been no successful case against anyone who tried to provide first aid to a person in difficulty. The courts have looked favourably on those who try to help others.

In some countries, and in most states in the United States, ‘Good Samaritan’ laws protect those who go to the help of others. In some of those places, the law requires members of the public to stop and help other people, but there is no such legal requirement in the UK.

Here, the SARA Act (Social Action Responsibility and Heroism Act [England and Wales] 2015) was introduced to encourage ‘volunteering and involvement in social action’. This Act requires the court, when considering a claim for negligence or breach of statutory duty, to take into account whether the defendant was:

- acting for the benefit of society or any of its members
- demonstrating a predominantly responsible approach towards protecting the safety or interests of others or
- acting heroically.

To date, there has been little experience with interpretation of this Act. It remains to be seen how the courts will apply it.

Could I/we be sued for not having an AED?

In the UK, a person or company may be judged negligent for failing to take appropriate safety precautions on their premises. This raises understandable concern that a person or company may be sued for failing to have an AED available when someone sustained a cardiac arrest on their premises. This has happened in some high-profile cases in other countries but, to our knowledge, not in the UK. To assess whether you need to provide one or more AEDs, consider who uses your premises and in what circumstances, and how likely any of them is to have a cardiac arrest?

To help you assess this, take a look at our risk assessment procedure in [Appendix B](#).

Could I/we be sued for not using an AED?

The answer to this question hinges on whether or not you have a legal duty of care to the person in cardiac arrest. A health professional has a duty of care to their patients and would be expected (in law, as well as professionally) to use their knowledge, skills and available equipment to act in their patients' best interests. Similarly, in the workplace, a designated first aider would be considered to have a duty of care to use their knowledge, skills and available equipment for the benefit of others on the premises. When a member of the public goes to the help of an ill, injured or collapsed person, they then have a duty of care to help, within the limits of their knowledge and skills.

7. Working with the ambulance service

People who want to install an AED need access to help and guidance, for example on exactly where to place it, how to make sure that it is most likely to save a life, and how to arrange CPR training and AED familiarisation to support this. The local ambulance service is a ready source of expertise in the provision of resuscitation services and can offer practical advice about the potential value and effectiveness of an AED in any situation, and about CPR training and AED familiarisation. Importantly, the ambulance service can record the location of the AED on their database, so that their staff who answer emergency calls can direct people to it when necessary.

How do I contact my local ambulance service?

Details of contacts for all ambulance services in the UK are provided in [Appendix A](#). Most ambulance services already train community first responders, so that they can respond (with an AED and other first aid equipment) to local emergencies that they can reach more quickly than an ambulance. Ambulance services are, therefore, well aware of the challenges facing all users of AEDs and organisations that install them.

Why are ambulance control rooms important?

The systems used in ambulance control rooms aim to maximise the contribution that anyone present at the scene of an emergency makes before the arrival of an ambulance. The staff who answer emergency calls encourage people at the scene to give CPR and to use an AED if available. These staff will usually tell the caller the location of the nearest AED (provided it has been made known to the ambulance service and entered on their database).

In some places first aiders working at a particular location make themselves available to be contacted by ambulance control and sent (with an AED if possible) to cases of suspected cardiac arrest in their immediate vicinity. The local ambulance service can advise on the potential for this type of arrangement. In addition, there is increasing use of smartphones and digital technology (e.g. GoodSAM: www.goodsamapp.org) that can recruit help from health professionals or first aiders who happen to be close to a suspected cardiac arrest and can direct them to the nearest available AED on their database. In some regions, use of such apps is now a well-established part of the ambulance service response to an emergency call reporting a possible cardiac arrest (e.g. Save a Life: www.scas.nhs.uk/save-a-life-with-our-new-app).

Should I register my AED?

The Resuscitation Council UK encourages all owners of AEDs to register their devices with their local ambulance service so that every AED can provide maximum benefit. Please see [Appendix A](#) for ambulance service contact details.

8. AEDs in the workplace

The aim of installing AEDs in the workplace is to protect the workforce and members of the public. The incidence of cardiac arrest in the workplace in the UK is not known, but in the USA (population 312 million), 400 deaths from cardiac arrest are reported to the Occupational Safety and Health Administration each year. Having an AED in the workplace, will ensure that a defibrillator is available immediately to give a person in cardiac arrest the best chance of survival, rather than waiting for the ambulance service to attend.

Is it common to have an AED in the workplace?

In 2012 the Institution of Occupational Safety and Health commissioned a survey of 1,000 business decision-makers across the UK. 513 reported that they did not have AEDs in their workplace. Almost two thirds of these negative responses came from medium to very large companies. Increasing the proportion of workplaces equipped with an AED will improve the chances of survival for employees in the event of cardiac arrest (figure 8.1).



Figure 8.1 Use of an AED in the workplace.

Who should use an AED in the workplace?

It is important to have an alerting system within the workplace so that, in the event of suspected cardiac arrest, an AED can be accessed quickly, even if the collapsed person is in another part of the workplace. The priority is to give the person immediate CPR while the AED is brought to them. Employees with first aid training make good AED operators, but use of an AED should not be delayed if they are not immediately available. Employees who are currently designated “first aiders” will have undertaken a First Aid at Work, or equivalent, training course. These courses include CPR training and AED familiarisation. Other employees may be designated “appointed persons” under the First Aid at Work Regulations and some of these employees attend an optional half-day course in which emergency resuscitation is covered. We recommend that both types of course include familiarisation with the use of an AED.

Is it mandatory to have an AED in the workplace?

Not at present: please see [section 5](#) and [section 6](#). However, some efforts are being made to promote the introduction of legislation to make provision of AEDs mandatory in the workplace, schools, sports venues, and certain public buildings. Notwithstanding the

outcome of this, the factors listed in [section 5](#) will help guide a decision about placing AEDs in any individual workplace. Clearly, when the workforce is large or there are substantial numbers of visitors, this strengthens the case for an AED being made available.

9. AEDs in schools

The Department for Education encourages schools in England to consider purchasing one or more AEDs, and has published ‘Automated external defibrillators (AEDs): a guide for maintained schools and academies’ (www.gov.uk/government/publications/automated-external-defibrillators-aeds-in-schools). It provides details on how to install, use and maintain an AED in school, and how to buy an AED. The guide’s buying arrangements are also open to:

- independent schools
- further education colleges
- local-authority-maintained nursery schools
- independent nursery schools
- pre-school establishments
- private, voluntary and independent nurseries
- playgroups
- holiday and out-of-school providers.

Is cardiac arrest common in children?

Fortunately, cardiac arrest is rare in school-age children, but when it does occur it is a particularly tragic event. Such cases inevitably receive publicity, and specialised charities provide valuable information to increase awareness and promote knowledge on the subject, as well as promoting research and improving recognition and treatment of the underlying causes. The precise incidence of cardiac arrest in children is not known as there is no national registry of such events. Autopsies cannot always identify the cause, because many of the heart conditions that cause cardiac arrest in this age group are not detectable after death. However, early use of an AED will improve the chances of survival for a child in cardiac arrest.

What is the evidence for having AEDs in schools?

A study to investigate the causes of cardiac arrest at schools in Seattle (population 1.5 million), a city with the best data in the world on cardiac arrest, reported 97 cardiac arrests over a 15-year period. Cardiac arrest occurred at 1 in 111 schools per year. This represented 2.6% of all cardiac arrests treated outside hospitals over the period. Twelve cardiac arrests occurred in students, 33 in teachers and other staff, and 52 in other adults not employed at the schools; thus almost 90% of the arrests occurred in adults rather than pupils. The estimated incidence of cardiac arrest in students was 0.18 per 100,000 students per year and in teachers and other staff 4.51 per 100,000 staff members per year. No particular part of a school was found to be a high-risk area but 6 of the 12 student cardiac arrests occurred during exercise. Other reports have mentioned a predominance of athletes among students who suffer cardiac arrest.

Are there special considerations when using an AED on a child?

Some AEDs require specific (smaller) paediatric pads for use on a child, depending on their body weight. The manufacturer's guidance should be followed and, where necessary, both adult and paediatric pads kept with the AED. Adult pads can be used on a child if no paediatric pads are available.

Are there other benefits of having an AED in a school?

An AED in a school is likely to be used infrequently and is more likely to be used on an adult than a pupil. However, an undoubted advantage of having AEDs placed in prominent positions in schools is that the pupils will become familiar with them and can learn about their purpose. This can be incorporated into training them in first aid and CPR. School-age children have been shown to be capable of using AEDs in simulated cardiac arrest scenarios. The Resuscitation Council UK recommends CPR training and AED familiarisation, not only for teachers and other responsible adults, but also for all school pupils. The government's plan to introduce compulsory first-aid and CPR training to the curriculum in all schools in England from 2020 is welcomed.

Wherever possible, consideration should be given to making a school AED available for public-access use in the local community.

10. Obtaining an AED

How can I obtain an AED, and which should I choose?

Several manufacturers supply AEDs directly to the purchaser or through medical equipment sales companies. An internet search will reveal many models and options, making choice confusing. Most of the AEDs currently intended for use by responders with little or no training are suitable for community AED schemes. Some models have additional features, designed for use by more highly trained responders. The ambulance service may provide recommendations (usually based on compatibility with the models they use locally). Contact your ambulance service Community First Responder lead for advice. They can help you to understand important differences between models, including the cost of the AED itself, the cost and shelf-life of batteries, the cost and shelf-life of the adhesive pads (electrodes), the duration of the manufacturer's guarantee, and the after-sales services provided. Some modern AEDs also contain GPS location systems and can be WiFi-enabled to allow remote monitoring (e.g. of battery status). All these factors can help you to make the best choice for your particular circumstances. When possible, it may be useful also to speak to others about their experience with a particular AED before making your choice.

How can we get the best value for money?

The purchase of more than one machine usually reduces the unit price, and such discounts should be sought when several AEDs are purchased. Large organisations (e.g. a supermarket chain) buying many devices should consider a formal competitive procurement exercise, as substantial savings can be made.

Can we get any financial help with buying an AED?

For many years, the British Heart Foundation has funded the purchase of AEDs, and it continues to do so, specifically where the AEDs are intended for public access. Enquiries about how to apply and the criteria for successful applications should be made through the British Heart Foundation website (www.bhf.org.uk/how-you-can-help/how-to-save-a-life/defibrillators/applying-for-a-public-access-defibrillator). You should also to contact your local ambulance service, who can advise further and consider supporting your application.

11. AED training and familiarisation

The crucial factor in the resuscitation of someone from VF is to provide a shock from a defibrillator with the minimum of delay. Time should not be wasted if a trained person is not available immediately. Untrained people have used AEDs successfully to save lives and lack of training (or of recent training) should not be a barrier. If someone is willing to use the AED they should do so. First-aid training should now incorporate AED familiarisation or training.

Is training required to use an AED?

No – as stated above, anyone can use an AED. The Resuscitation Council UK and British Heart Foundation recommend that the poster shown in figure 11.1 is displayed beside or on an AED cabinet, to inform and encourage members of the public to use the AED when it is needed, regardless of whether or not they have received any familiarisation or training.



Figure 11.1 Poster to encourage use of an AED by members of the public.
Free download of this is available at: www.resus.org.uk/defibrillators/standard-sign-for-aeds

However, there are advantages of having a core number of appropriately trained personnel in the vicinity of any AED. Training people to use an AED can be achieved quickly with minimal cost and gives these people the confidence to act quickly and use the AED to try to save a life. Nevertheless, use of the AED by others should never be discouraged or prohibited. People should not wait for a trained responder to arrive before calling 999, starting CPR, sending someone to fetch an AED, and using an AED. Providers of training include the ambulance services, the first aid organisations (e.g. the British Red Cross, St John Ambulance, St Andrews and Royal Life Saving Society) and private training companies.

Increasingly, online and distance-learning programmes in CPR training and AED use are available and are likely to be used more widely, particularly but not exclusively for refresher training. The Resuscitation council UK has produced ‘Lifesaver’ (www.resus.org.uk/apps/lifesaver) and ‘Lifesaver VR’ (www.resus.org.uk/apps/lifesaver-vr), interactive video educational apps, which teach people how and when to give CPR and use an AED. They are free of charge and are very useful educational resources for this type of training. Lifesaver can be used easily on any computer, and on most popular smartphones and tablets.

As mentioned above, volunteers with first aid experience can install a smartphone app, to receive alerts about life-threatening emergencies (such as cardiac arrest) in their vicinity, and about the nearest available AED. They can attend the emergency without delay and give appropriate first aid, including CPR and the use of an AED if needed.

A detailed statement of [training requirements](#) is available on the Resuscitation council UK website (www.resus.org.uk) and many frequently asked questions are dealt with in the [FAQs section](#).

12. Installing, locating and signposting an AED

When an organisation or community is planning purchase of one or more AEDs, there are several important considerations:

1. Anyone needing to use it to try to save a life must be able to find it quickly and take it to the collapsed person without any delay. This means that, wherever possible:
 - it should be placed in a prominent location so that people can see it easily

- its location should be shown using the recommended sign (figure 12.1)
- direction signs should be used to guide people to its location (figures 12.2, 12.3), so that they are visible anywhere within the operational radius of the AED (see 2 below)
- anyone living or working in its location should know what it is, what it is for and be able to direct people to it immediately
- equally, everyone should know how to call for help in the event of accident or sudden illness
- it should not be locked away
- it should be available 365 days per year and 24 hours per day.



Figure 12.1 The recommended sign for advertising the location of an AED.
Free download of this is available at: www.resus.org.uk/defibrillators/standard-sign-for-aeds

2. AEDs should be sited as close as possible to their most likely place of use, considering:
 - the layout of the building or venue
 - the number of people at potential risk in each place
 - the time and distance involved in getting it to a collapsed person.

In general, an AED should be accessible within 200 metres or two minutes' brisk walk (four minutes there and back) from where it is needed. In a location where this is unlikely to be possible, placing more than one AED in different parts of the location should be considered. In some (e.g. rural) settings this may not be realistic; other ways of minimising delay in obtaining the AED should be considered.



Figure 12.2 Example of a stand-alone direction sign that could be used to help people find the nearest AED quickly.

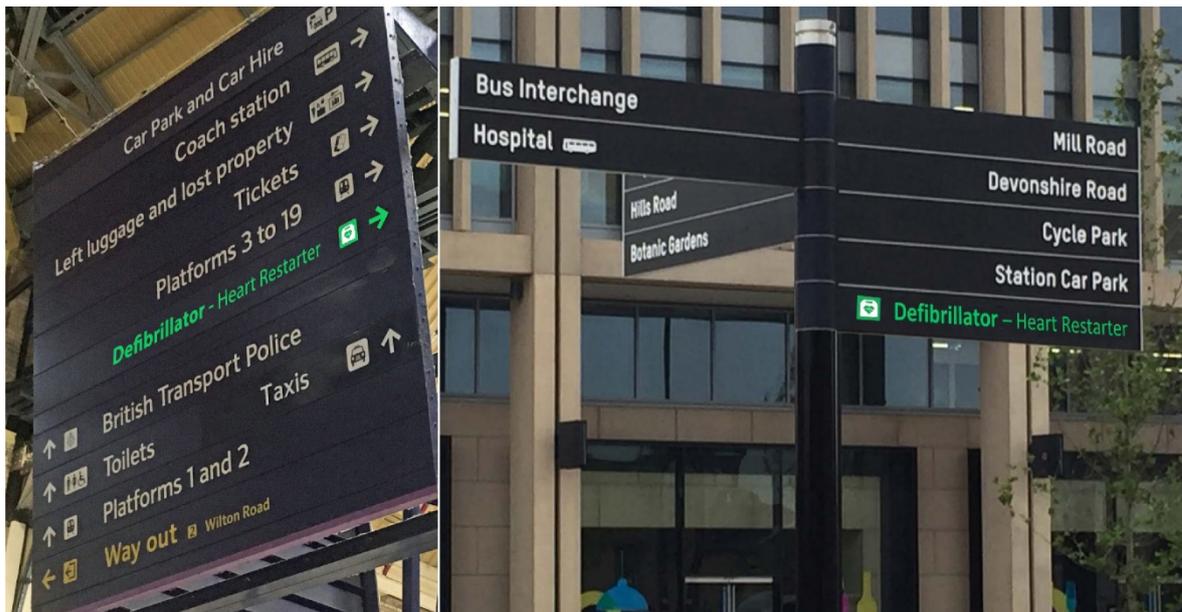


Figure 12.3 Examples of signs that could be included with other direction signs (e.g. at stations or in towns and villages) to help people find the nearest AED quickly.

3. Most AEDs in public places are kept in protective cabinets (Figure 12.4). There is understandable concern that an AED in a public place may be at risk of theft or vandalism. Unfortunately, any arrangements to try to protect it will almost certainly create delays in getting it to the person who is in immediate need of it. The Resuscitation council UK’s recommendation is that AED cabinets should not be locked (see [Appendix C](#)). Thankfully, instances of theft or vandalism have been relatively uncommon: they have targeted AEDs in locked cabinets as well as unlocked ones.



Figure 12.4 An example of a cabinet containing an AED that has been made available for public access.

Nevertheless, an AED that has been stolen or damaged will be of no use to anyone. If the risk of theft or vandalism is considered substantial, this should be addressed with the help of professional expertise, such as the local police crime prevention service. Any protective measures must aim also to minimise delay in obtaining access to the AED when it is needed.

4. Organisations with AEDs should have a formal policy to ensure that they are maintained in working order (see [section 13](#)), and to ensure that they are available for public access wherever and whenever possible. Ideally, this means that an AED is available for public access 24 hours per day and 365 days per year. For many organisations (e.g. schools, dental practices, gymnasias) this will mean siting an AED outside the entrance to the premises, but this will have to be balanced against the

importance of siting the AED where it is most likely to be needed by the users of the facility.

5. When purchasing one or more AEDs, you should consult and inform the local ambulance service. They may be able to offer guidance on the choice of location for an AED. Importantly, they can ensure that they record its location on their database, ensuring that their call-handlers can direct people to it rapidly if a cardiac arrest occurs nearby.

13. Maintenance

Does an AED require maintenance?

Owners or managers of an AED are not expected to carry out any maintenance tasks other than replacing the battery when necessary (as indicated by the service light on the AED, or at routine maintenance), and replacing used or out-of-date disposable items such as adhesive pads (electrodes), razor and plastic gloves. The shelf life of these (unused) is usually 3–5 years, so such maintenance tasks are infrequent (unless the AED is used frequently). In all cases, the manufacturer's instructions should be followed. If used, the electrode pads may be replaced without charge by the ambulance service, but you will need to confirm with them from the outset whether they can offer to do this.

How would we know if an AED had a problem needing action?

All AEDs currently on sale perform regular self-checks and if a problem is detected it will be indicated. In most cases this is shown by a warning sign or light visible on the front of the machine. Those owning or managing an AED should have a process in place for it to be checked regularly and frequently for such a warning, and for appropriate action to be taken when necessary. If this task is allocated to one individual, robust arrangements must be in place to ensure that the checks are performed by someone else in their absence. Most manufacturers will provide a temporary replacement AED if one has to be removed for servicing. Arrangements for this should be clarified and agreed during the process of buying an AED.

Is it costly to maintain an AED?

After the initial purchase, the cost of providing an AED for public access is small, and mostly consists of the cost of replacing disposables such as adhesive pads if they are used

or out-of-date. If possible, an annual maintenance programme is recommended. Eventually, there will be an occasional need to replace an AED with a new one, so consideration of this should be included in planning an AED programme. As stated previously, most modern AEDs have a battery life (unused) of around 10 years or more.

14. Event reporting and debriefing

When an AED is used, the electrocardiogram showing the heart rhythm, together with details of any shocks given are usually stored in an electronic memory within the AED. This information should be downloaded from the AED immediately after the event. The record can provide crucial information that can help to ensure that the patient receives the correct treatment afterwards.

How is the downloading done?

This will usually be done by the ambulance service. The downloading process is usually straightforward with modern AEDs (simply connecting the AED to a computer with a cable, Bluetooth or Wi-Fi) but details of how this is done should be clarified when buying the AED. Special software is usually required and is provided by the manufacturer. The need to have this available at a location should be decided at the outset, whenever possible in conjunction with the ambulance service.

What else should be done after an AED is used?

Debriefing for anyone involved in a resuscitation attempt, regardless of the outcome, is very important. Encountering a cardiac arrest and attempting resuscitation is stressful for all involved, especially for members of the public who have tried to help. Those responsible for the medical supervision of any AED programme should be supported in establishing a robust arrangement for debriefing after any such incident. In most cases, the ambulance service (who are likely to be involved with any cardiac arrest) will be able to advise and may be able to offer to contribute to the debriefing process.

Returning the AED to its usual place and replacing any used disposables, especially adhesive pads (electrodes), is important to ensure that it is available for further use as soon as possible.

Appendix A – Ambulance service contacts

Introductory note:

This information is correct and up-to-date as of March 2019. If you have any difficulty contacting your local ambulance service using these details, please refer to the website of the ambulance service you are trying to contact.

Please also note that these services are subject to high demand, and the email inboxes listed below are not all monitored daily, and so you may experience a short delay in response if contacting your local ambulance service via email.

This information will be updated annually.

East of England Ambulance Service

Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk

Tel: 0345 601 3733

Email: defibs@eastamb.nhs.uk or eeastcfrs@eastamb.nhs.uk

Website: www.eastamb.nhs.uk/

East Midlands Ambulance Service

Derbyshire, Leicestershire, Rutland, Lincolnshire, Northamptonshire and Nottinghamshire.

Tel: 0115 884 5000

Email: community.responder@emas.nhs.uk

Website: www.emas.nhs.uk/

Isle of Wight Ambulance Service

Tel: 01983 534111

Email: ambulancetraining@iow.nhs.uk

Website: www.isleofwightambulance.co.uk

London Ambulance Service

Greater London, including the area enclosed by the M25

Tel: 020 7783 2366

Email: defib@londonambulance.nhs.uk

Website: www.londonambulance.nhs.uk/

See also: www.londonambulance.nhs.uk/calling-us/emergency-heart-care/cardiac-arrest/

North East Ambulance Service

Northumberland, Newcastle, Gateshead, Tyneside, Sunderland, County Durham, Darlington, Hartlepool, Stockton, Middlesbrough, Redcar and Cleveland

Tel: 0191 430 2000

Email: firstresponder@neas.nhs.uk

Website: www.neas.nhs.uk

North West Ambulance Service

Cumbria, Lancashire, Merseyside, Cheshire, Greater Manchester

Tel: 0345 112 0999

Email (Cheshire and Mersey): camcrtinterests@nwas.nhs.uk

Email (Greater Manchester): Gm.cfrinterest@nwas.nhs.uk

Email (Cumbria and Lancashire): Mark.evans@nwas.nhs.uk

Website: www.nwas.nhs.uk/

Northern Ireland Ambulance Service

Tel: 028 9040 0999

Email: resus.admin@nias.hscni.net

Website: www.nias.hscni.net

St John Emergency Ambulance Service (Guernsey)

Tel: 01481 725211

Email: administration@stjohn.gg

Website: <https://stjohn.gg/>

Scottish Ambulance Service

Tel: 0131 314 0000

Email: scotamb.pad@nhs.net

Website: www.scottishambulance.com/

South Central Ambulance Service NHS Foundation Trust

Berkshire, Buckinghamshire, Hampshire and Oxfordshire

Tel: 01869 365 100

Email: defib@scas.nhs.uk

Website: www.scas.nhs.uk/

South East Coast Ambulance Service

East Sussex, West Sussex, Kent, Surrey, and North East Hampshire

Tel: 0300 1230999

Email: pad@secamb.nhs.uk

Website: www.secamb.nhs.uk

South Western Ambulance Service

Cornwall and the Isles of Scilly, Devon, Dorset, Somerset, Bristol, Bath and North East Somerset, Wiltshire, Swindon and Gloucestershire

Tel: 01392 261647

Email: defibrillators@swast.nhs.uk

Website: www.swast.nhs.uk/welcome

States of Jersey Ambulance Service

Tel: 01534 444710 / 444711

Email: ja.davison@health.gov.je

Website: www.gov.je/emergency

Welsh Ambulance Service

Public Access Defibrillation:

Tel: 07734 716766

Email: gerard.rothwell@wales.nhs.uk

Website: www.ambulance.wales.nhs.uk/

West Midlands Ambulance Service

Shropshire, Herefordshire, Worcestershire, Warwickshire, Staffordshire, Birmingham and Black Country.

Tel: 01384 215855

Email: cfradmin@wmas.nhs.uk

Email (Staffordshire): matt.heward@wmas.nhs.uk

Email (Birmingham & Black Country): andy.jeynes@wmas.nhs.uk

Email (Shropshire, Worcester & Hereford): cliff.medlicott@wmas.nhs.uk

Email (Coventry & Warwickshire): bobby.qayum@wmas.nhs.uk

Website: <https://wmas.nhs.uk/>

Yorkshire Ambulance Service

Tel: 0333 1300516

Email: yas.aed@nhs.net

Website:

www.communityresponders.yas.nhs.uk/Community_Public_Access_Defibrillators.html

Appendix B – Do I need an AED? The first aid needs assessment

This risk assessment tool was agreed and adopted by the BLS Subcommittee of the Resuscitation Council UK in May 2015 and is considered valid at the time of publication of this guide in 2019.

Introduction

All businesses and organisations will undertake a first aid needs assessment to determine the level of first aid provision within their workplace as a part of their responsibilities to protect the safety of their workforce and visitors. As an organisation or company, it is a legal requirement to take precautions to reduce foreseeable risks, to document this and be able to present it to the HSE if requested. As part of this assessment it is quite appropriate to consider the risk of a cardiac arrest occurring in the workplace and investing in automated external defibrillators (AED).

Completing a first aid needs assessment entails making an estimate of the risk of a cardiac arrest occurring at a location and considering the potential consequences if it were to occur. The process is not as complicated as many people think. In its most basic form, it is a way of recording the steps taken to ensure the safety of people at a particular site. By putting this information in a standard format, it allows companies and organisations to ensure that everyone is following the same steps. Companies will often do their assessments in slightly different ways, although most share the same basic information. This is not intended to be a rigid, objective or scientific process but just a simple method to help managers to prioritise and take appropriate measures. It is not a legal requirement to perform such an assessment, but it is considered standard practice. Assessing and recording risks in one place (e.g. a charity shop) might be a very different matter from recording risks in another (e.g. a coal mine). This is why there is no universally accepted format for conducting a risk assessment. Further information and worked examples are available from the Health and Safety Executive (HSE) on their website www.hse.gov.uk.

How to assess the need for an AED

The method of conducting a first aid needs assessment advocated here employs the widely used methods used to assess the risk of any adverse event occurring. The key procedure is the calculation of a numerical score based on two variables:

1. The likelihood of an event occurring

2. The consequences or severity if the event actually occurred.

Each of these variables is given a score from 1–5 and the product of the two scores provides a total score on which to base actions.

1. The likelihood of cardiac arrest occurring

The risk of an arrest occurring varies according to several factors, each of which should be considered when assigning the score.

- The number of people passing through the site/footfall. In most cases, the larger the number present, the greater the risk.
- The age of those present (as cardiac arrest is commoner with increasing age).
- The nature of the location. Some places are higher risk than others. Experience has shown that where large numbers of the public are present in busy places like transport hubs (e.g. airports and railway stations) cardiac arrests are more likely to occur. In other places, the nature of the work undertaken (e.g. the use of toxic chemicals) may be relevant to deciding on the need to invest in an AED.

To help attach a numerical value to the likelihood of cardiac arrest occurring, the descriptions in table B1 can be used.

Probability	Score	Probability of risk being realised	Description
Almost certain	5	76–100%	Risk has high likelihood of occurring despite precautions
Likely	4	51–75%	Risk has high likelihood of occurring
Moderate	3	26–50%	Risk has a moderate likelihood of occurring
Unlikely	2	11–25%	Risk is considered unlikely to occur
Rare	1	0–10%	Risk will occur in rare circumstances

In the case of cardiac arrest, the likelihood of the event occurring in most public places and workplaces will be low with a score of 1 or 2. Examples might include a small shop, garage or workshop. Some higher risk sites like busy transport hubs and sports centres

will justify a score of 3, possibly even 4. Higher scores are unlikely outside a specialist healthcare setting.

At present there is insufficient published evidence to give precise or dogmatic advice for an individual location and the rating score applied has to be a 'best-guess' or estimate. More accurate information will be available with increasing experience and we encourage research in this area.

2. The consequences (severity) of cardiac arrest occurring

In a typical risk assessment, a score of 1–5 will be allocated based on the consequences of the event occurring. Table B2 shows a convenient grid that might be used.

Score	Consequences	Description
1	Negligible	Minimal or no effects if event occurs
2	Minor	Consequences very minor, no lasting effects
3	Moderate	Important consequences
4	Major	Significant impact / injury on anyone affected
5	Extreme	Death or serious injury

However, cardiac arrest is uniformly fatal (unless treated), so the score will always be 5. Even if resuscitation is successful, the impact on the individual will be significant, for example they will be in hospital for some time and probably require additional clinical interventions, so the score will remain the same at 5.

Risk rating score

Risk = Severity (5) x Likelihood

By multiplying the scores for the severity and likelihood, the risk is given a numerical value ranging from 1 (unlikely to happen and with minimal consequences even if it does occur) to 25 (highly likely to happen with disastrous consequences). Given the severe consequences of cardiac arrest in the present example the minimum score will be 5. Table B3 shows a convenient way to plan a response depending on the score calculated.

Table B3	
Rating Score	Action
1–4*	Broadly acceptable - no action required
5–9	Moderate - reduce risks if reasonably practicable
10–15	High Risk - priory action to be undertaken
16–25	Unacceptable - action must be taken IMMEDIATELY

* This score will not be possible in the case of cardiac arrest because of the severe consequences necessitating a minimum score of 5.

Alternatively, the colour of the square on the grid in Figure B1 that contains the calculated risk score can be used to guide actions.



Figure B1. Risk Assessment grid

Low risk (green) – Quick, easy measures implemented immediately and further action planned for when resources permit.

Moderate risk (orange) – Actions implemented as soon as possible, but no later than the next financial year.

High risk (yellow) – Actions implemented as soon as possible and no later than six months.

Extreme risk (red) – Requires urgent action. Senior management to be made aware and immediate corrective action to be implemented.

The majority of locations with a low footfall will score below 10, but busy transport hubs would score at least 15, possibly 20.

Management of risk of cardiac arrest

The best chance of successful resuscitation will be when defibrillation and other first aid procedures are carried out with the minimum delay (ideally within the first three minutes). The chances of resuscitation fall by at least 10% with every minute that defibrillation is delayed so there is a very real advantage in having an AED available on site. Figures of 75% survival have been reported when defibrillation is performed within three minutes of someone collapsing, a time frame rarely possible for the ambulance service who aim to reach the majority of urgent calls within eight minutes.

Using the close proximity of an ambulance station as a justification for not installing an AED, will introduce a flaw in your risk assessment, as this assumes that ambulances are always on standby in the ambulance station. What actually occurs is that the NHS Ambulance Trust will deploy the ambulance where it is most likely going to be needed and this may be a considerable distance from the station.

Using the risk assessment system described above, most sites will score either 5 or 10 which suggests that there is a reasonable possibility of a cardiac arrest occurring in most locations. Unfortunately, there is very little that can be done to reduce this risk. This means that the only practicable action possible is to ensure that in an emergency the location and accessibility of the AED is easy and well known to all staff (particularly those who are required to act as workplace first aiders). In these situations, it is also important that staff receive regular training in resuscitation techniques and are familiar ideally through training in how to use an AED. Indeed, HSE in their guidance strongly recommend that workplace first aiders receive annual refresher training in order to maintain their competency.

Appendix C – Cabinets for public-access defibrillators: to lock or not to lock?

This consensus statement was agreed and adopted by the Community Resuscitation Steering Group for England in November 2015. It is considered applicable in all four UK nations. It is supported by the British Heart Foundation and is considered valid at the time of publication of this guide in 2019.

Introduction

When someone suffers sudden cardiac arrest, prompt action by anyone nearby offers their only chance of survival. An immediate 999 call for an ambulance and starting cardiopulmonary resuscitation (CPR) immediately are essential. Most people who survive will have needed a shock from a defibrillator to correct a chaotic heart rhythm.

The earlier that shock is given, the better the person's chance of survival. Studies have shown that a shock given within three minutes of cardiac arrest provides the best chance of survival and that even one minute of further delay reduces that chance substantially. In most situations, ambulance services would be unable to reach the scene of a cardiac arrest and deliver a shock within three minutes. Further studies have shown that immediate delivery of CPR combined with early use of an automated external defibrillator by members of the public gives a person in cardiac arrest the best chance of surviving.

For that reason there are increasing numbers of automated defibrillators available for use by members of the public. They are referred to as 'public-access defibrillators'. They are simple to use and can be used effectively and safely by people who have had no prior training.

Cabinets for public access defibrillators

Public-access defibrillators are usually kept in cabinets in prominent public locations with appropriate signs to help people to find them and know what they are. There has been a long-running debate about whether these cabinets should be openly accessible (unlocked) or whether they should be locked. The main options are between unlocked cabinets and different types of lockable cabinets.

Some locked cabinets need a numerical code to unlock the door. The ambulance service will give this code to the person who makes the initial 999 call, once they have confirmed

that they are dealing with a cardiac arrest. Other locked cabinets can be unlocked remotely from the ambulance control centre in this situation.

Measures other than locks may be used to protect a defibrillator in an unlocked cabinet (see below). Advances in technology may lead to other options in the future.

Advantages and disadvantages of unlocked and locked cabinets

The priority is to get a defibrillator and apply it to the person in cardiac arrest with an absolute minimum of delay. Unlocked cabinets allow immediate access to a defibrillator in a situation where seconds count.

There is concern that a defibrillator in an unlocked cabinet may be stolen or tampered with, making it unavailable or of no use to a person in cardiac arrest. However, despite widespread use of unlocked cabinets, experience to date has shown that instances of theft and vandalism of such defibrillators are relatively uncommon.

Locking a cabinet is no guarantee that a defibrillator will not be stolen or vandalised. Locking a defibrillator in a cabinet implies that it is sufficiently valuable to be worth stealing. Reports from ambulance services and other sources provide no evidence that public-access defibrillators in locked cabinets are less likely to be stolen or vandalised.

Lockable cabinets inevitably introduce delay in obtaining a defibrillator and applying it to a person in cardiac arrest. A person who knows where the nearest public access defibrillator is and runs straight to the cabinet to fetch it (whilst other people call 999 and start CPR) will have to call 999 themselves before they can get the defibrillator and take it to where it is needed. This wastes valuable time in getting it to the person in cardiac arrest and requires an extra call to an ambulance service that has to respond promptly to many other calls.

Other crime prevention measures may reduce the risk of theft and tampering with a public-access defibrillator. These might include siting the cabinet in a public place that is covered by closed-circuit television surveillance, use of tracking devices in defibrillators, so that their removal from the cabinet is known about immediately and their whereabouts is traceable, or other clearly advertised measures that will discourage criminal interference.

Another factor to consider is cost. A defibrillator and lockable cabinet or a defibrillator with additional technology (such as remote tracking) costs substantially more than a simple cabinet and straightforward defibrillator respectively.

Recommendation

Where conditions allow, defibrillators should be placed in openly accessible (unlocked) cabinets that allow immediate access in an emergency. A decision to place a public-access defibrillator in a locked cabinet should be made only on the basis of careful risk assessment in that specific location.

Liaison and collaboration with the local ambulance service is crucial to the success of any public access defibrillator scheme. It is essential to take their advice on the type of defibrillator and cabinet to install. Some ambulance services have a policy only to work with defibrillators in unlocked cabinets.

In case of uncertainty, we recommend that you take advice from your local crime prevention officer about the risks of theft or vandalism and the security measures that will minimise these without making the defibrillator inaccessible or creating avoidable delay in access to it when it is needed.

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