



Penang Heart Safe Program Toolkits

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Introduction

Thousands of Sudden Cardiac Arrests (SCA) occur each year amongst Malaysians. Most cardiac arrests occur at home, witnessed mostly by family and friends. Performing CPR and using an AED before the arrival of the ambulance team increases the chances of survival significantly. CPR helps to restore blood flow to those with cardiac arrest; and when performed by family or friends who are present can lead to a greater chance of survival. AEDs are safe and effective electronic devices that can help restart the heart in emergency situations which can be used by members of the public.

Penang Heart Safe Program

In light of the above mentioned, the Penang Heart Safe Society initiated the Penang Heart-Safe Programme in the aims of increasing out-of-hospital survival outcome from sudden cardiac arrest. The initiative was launched in



2015 with the support of the Penang State Government, and to date, is spearheaded and run by the Penang Heart Safe Society and community volunteers.

The Penang Heart-Safe Programme is the first of its kind in Malaysia, making Penang the first state to initiate a heart-safe community that installs AEDs in public places and empowers lay rescuers to participate in lifesaving, thus enabling a better place for its residents to live in. Key elements of the Penang Heart-Safe programme include:

1. Initiating and increasing the number of SCA awareness campaigns in the state, with combined support from NGOs, medical communities and associations, private corporation and industry players.
2. Conducting mass CPR and automated external defibrillator (AED) trainings to the general public
3. Initiating placements of AEDs in public venues and creating first responder sites at high risk of SCA
4. Empowering the use of AEDs by the general public/first responders via continuous education and training in CPR & AED.

1.0. Introduction to AEDs and OHCA

1.1. What Are AEDs?

AEDs are portable, life-saving devices designed to treat people experiencing sudden cardiac arrest, a medical condition in which the heart suddenly and unexpectedly stops beating. The AED system includes accessories, such as a battery and pad electrodes, that are necessary for the AED to detect and interpret an electrocardiogram and deliver an electrical shock. There are two main types of AEDs: public access and professional use.

- **Public access AEDs** can be found in airports, community centers, schools, government buildings, hospitals, and other public locations. They are intended to be used by laypeople who have received minimal training.
- **Professional use AEDs** are used by first responders, such as emergency medical personnel and paramedics, who receive additional AED training.

1.2. What is Sudden Cardiac Arrest (SCA)

Sudden cardiac arrest (SCA) occurs when the heart unexpectedly stops beating effectively. It can happen at any age, anywhere and anytime, but it usually happens in the home, workplace, or community, away from the advanced life support available in the hospital environment. SCA is a significant contribution for OHCA. At this moment time is critical. If nothing is done to help this victim, brain cell death starts within 4 minutes with no CPR and permanent brain damage is certain after 10 minutes.

1.2.1 How is sudden cardiac arrest (SCA) different from a heart attack?

A heart attack is different from an SCA. A heart attack happens when blood flow to the heart is blocked. During a heart attack, the heart usually doesn't suddenly stop beating. With an SCA, the heart stops beating.

Sometimes an SCA can happen after or during recovery from a heart attack. Your heart has an electrical system that controls the rate and rhythm of your heartbeat. An SCA can happen when the heart's electrical system is not working right and causes irregular heartbeats.

1.2.2 Causes Of Sudden Cardiac Arrest

- I. coronary artery disease (CAD)
- II. Some types of **physical stress** can cause your heart's electrical system to fail, such as Intense physical activity in which your body releases the hormone adrenaline. This hormone can trigger SCA in people who have heart problems.
- III. Very low blood levels of potassium or magnesium. These minerals play an important role in your heart's electrical system.
- IV. Electrocution
- V. Major blood loss
- VI. Severe lack of oxygen
- VII. **Certain inherited disorders** which can cause arrhythmias or problems with the structure of your heart
- VIII. **Structural changes in the heart**, such as an enlarged heart due to high blood pressure or advanced heart disease. Heart infections can also cause changes to the structure of the heart.

1.2.3. Bystanders who have witnessed collapsed victim can help by performing CPR, which restores blood flow to the brain and heart. and then using the AED which will assess and restart the heart. CPR functions to support the heart and lungs until the AED or further help arrives. AEDs placed in public places allow the use of these devices when they are most needed. The AED is safe and easy to use. AED assesses the rhythm of the heart and only delivers a shock to restart the heart if needed. It will not do harm and will not shock anyone unnecessarily.

1.3. What is OHCA?

An out of hospital cardiac arrest (OHCA) is defined as cessation of cardiac mechanical activity, confirmed by the absence of signs of circulation and that which occurs outside the hospital setting (1. Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, et al. Heart Disease and Stroke Statistics-2011 Update A Report From the American Heart Association. *Circulation*. 2011;123(4):e18–e209.)

1.4. Rationale of High Quality CPR and AED in Management of OHCA

CPR is performed to restore, maintain breathing, circulation, to provide oxygen and blood flow to the heart, brain and vital organs when the heart stops functioning

Early cardiopulmonary resuscitation (CPR) and early advanced care have a crucial role in management of OHCA. Every minute lost in initiating CPR leads to a 10% decrease in survival rates of the victim.

1.4.1. High-Quality CPR

- I. Achieving a rate of 100–120 compressions per minute
- II. Compressing the chest to a depth of 5–6 centimeters
- III. Allowing full chest wall recoil after each compression
- IV. Minimizing interruption in compressions
- V. Avoiding excessive ventilation

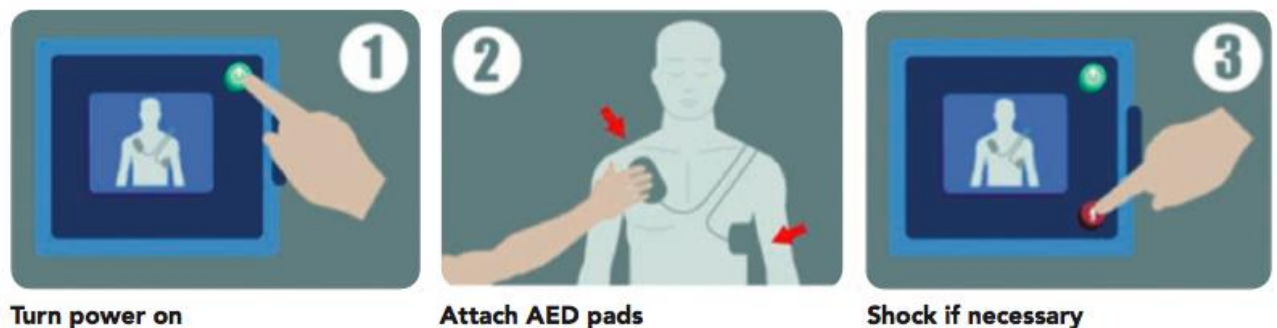
When there is cardiac arrest, bystander should initiate and continue CPR at the scene until the arrival of AED. CPR alone is not enough, AED is used to terminate abnormal electrical activity of the heart (if present) and restore the normal cardiac rhythm. CPR alone have a 5% survival rate compared with a 75% survival rate when coupled with and AED in the first few minutes.

Certain AED provide visual and audio feedback guides rescuers to deliver CPR compressions fast enough and deep enough to help save a life.

1.4.2. Using your AED

Your AED is a specialized electronic device designed for simple use, which assesses the heart in cardiac arrest, delivering a shock to restart the heart if needed. But the opportunity to use the AED effectively to save a life will only present itself momentarily. After that, the damage to the heart and brain may become irreversible. Time is therefore crucial. Early CPR and use of the AED is vital. You don't have to be a medical professional to use an AED - they are safe, highly effective and simple to use. All AEDs operate the same way in three easy steps.

Once the AED is turned on, it will coach you through the steps for its proper use. This is provided by verbal and visual instructions on what to do in emergency situations, and will only deliver a shock if needed to revert the cardiac rhythm.



1. Turn power on by either opening the lid or pressing the power button, depending on the model.

2. Attach AED pads to bare chest. Use the pictures on the pads to place them correctly.

3. Press the flashing button if the machine indicates that a shock is necessary. Continue CPR if no shock is advised.

Source: Heart and Stroke Foundation of Canada - AED Program Tool-kit

1.5. AED selection

There are many different types of AEDs and a number of different distributors to choose from. We should be looking for an AED that comes with clear and easy-to-understand instruction

1.5.1. Suggested features of AED;

- I. Safe and easy to use
- II. Automatically determines whether defibrillation appropriate and analyzes heart rhythms
- III. Guides user step by step and advises if a shock is required
- IV. Portable and effective
- V. Advices user to perform high quality CPR

1.5.2. Considerations of purchasing an AED;

- I. Well-known and trusted manufacturer which provide user training upon purchase
- II. Manufacturer with country presence that provides post-sales support and training
- III. Warranty of minimum 5 years

- IV. AED with LED/LCD screen that provides text prompts, along with audio and graphic prompts/cues to aid all types of rescuers in the emergency is recommended.
- V. Suitability for paediatric/child used (important for facilities used by individuals under 8 years old)
- VI. Battery & electrodes pads standby/shelf life of at least 2 years (to ensure manufacturers aid AED coordinators in maintaining AED's readiness for use)
- VII. As per the recommendations of the current American Heart Association (AHA) guidelines, use of real time CPR feedback in AEDs is recommended and preferred over devices that provide only prompts to ensure high quality CPR is provided to the victim. Use of real time CPR feedback should be considered as part of a comprehensive system for cardiac arrest.
- VIII. AEDs approved for sale by the Medical Device Authority (MDA) Malaysia.

1.5.3. Costs of Implementation

Implementation Cost of the AED program (site location budget) includes;

- I. the AED device,
- II. its accessories (normally include extra pads and a rescue-ready kit of gloves, mask, scissors, razors),
- III. AED signage,
- IV. device mounting stations,
- V. training

1.5.4. Maintenance cost (site location budget) includes;

- I. replacement of defibrillation pads (after every use or upon expiry of the pads)
- II. replacement of battery (after every use or upon expiry of the battery)
- III. continuous periodic training
- IV. annual AED Drill

1.6. Guide for prioritization of AED Placement

I. Response Time

An efficient PAD program would optimally be able to achieve a 3-minute response time from collapse of patient to arrival on-scene of the AED with a trained rescuer.

II. Incidence Rate

Based upon historical data, identifying locations at which the incidence of cardiac arrest is high, or higher, is important in identifying AED placement sites.

III. Volume and Risk of Visitors/ Employees

No research is yet available that shows a threshold number for placing AEDs. However, common sense indicates that locations with large numbers of employees, visitors or both have a greater need for an AED than locations with lower numbers.

IV. High-Risk Activity

Assessing the “high risk” activity at a location can be helpful in determining the need for an AED. Obviously, a health/exercise facility with an aging population has a higher risk for incidence than a location with minimal physical activity

V. Vertical Response Time

Response time should be calculated based upon how long it takes to reach a potential victim, not the time it takes medical help to reach a particular street location. Large office complexes or high-rise buildings present often-challenging obstacles to providing early defibrillation. The presence and location of AEDs in these settings can greatly impact survival rates.

VI. Multiple Placements In Large Areas or High-Traffic Locations

Consider placing more than one AED at a location that covers a large area, has multiple buildings or floors or has a significantly high number of employees or visitors. Each location should determine whether one AED will be able to provide timely and early defibrillation. Currently there’s no research that indicates a recommended coverage area for an AED, however achieving a 3-minute response time should be the primary guide to making placement decisions.

1.7. Propose location for AED Placement

- I. Places of public assembly (facility with a capacity of over 300 people & facilities where an expected 100 persons could be gathered at any time) i.e. stadiums, community halls, places of worship, shopping centres
- II. State owned buildings i.e., Parliament, courts, municipalities, military camps, state facilities, correctional facilities
- III. Long distance transportation hubs and its vehicles i.e., airports, train stations, ferry terminals, bus terminals
- IV. Fitness/sporting facilities – including but not limited to golf clubs, badminton courts, futsal centres, health clubs, gyms, swimming pools, etc.
- V. Dental offices, if anaesthesia is administered
- VI. Tourist sites/areas (where an expected 100 persons could be gathered at any time) i.e., museums, landmarks of interest, recreational parks, heritage sites, places of worship
- VII. MICE (meetings, incentives, conferences and exhibitions) facilities i.e., hotels, conference centres
- VIII. Large leisure facilities i.e., auditoriums, stadiums, theatres, extreme sports facilities
- IX. Factories/industrial area
- X. Large educational institutional campus

1.8. Criteria for AED Placement

There are several characteristics to ensure proper placement of an AED device:

- I. It should be easily visible.
- II. It is easily accessible to the public (e.g., not locked in a drawer or closet).
- III. It should be accessible from a location that prevents or minimizes the potential for tampering, theft and/or misuse by unauthorized users.
- IV. Placed in a wall-mounted cabinet at eye level with clear signage for quick identification. Preferably with attached siren which is activated once the cabinet is opened.
- V. In a location that is publicized and known to people who frequent the facility / building; signage must be clearly seen from multiple angles for easy access

- VI. It is in a publicized location that has information on how to initiate internal and external emergency responses and call for help.
- VII. It is placed close to trained responders such as security guards, lifeguards and designated first aid stations.

1.9. Initiation and Maintenance AED Program

Facilities with an AED program should nominate a program manager who will supervise and coordinate the AED program at his/her facility.

The program manager can be from the existing ERT team, facility management office or site supervisor as person in charge.

Roles of the coordinator should include the following:

- i. Coordinate with the State AED Program Task Force on recommendations for AED placement, training needs and requirements for monitoring and device registration
- ii. Arrange for purchase and installation of AED devices, cabinets and signage
- iii. Identify number of facility / building staff who will need to be trained in both CPR and AED use, ensuring they are certified annually in such training, as per scheduled in recommendations by the State AED Program Task Force
- iv. Implement a system of maintenance for the devices (daily/monthly) in collaboration with manufacturers recommendations and assistance
- v. Perform periodic inspection of AEDs as per device manufacturer's advice
- vi. Replace AED pads & batteries upon expiry or worn out
- vii. Register number of devices and its location (per organization/community) with State AED Registry

1.9.1. Getting the word out

- I. Letting individuals know about the AED, its location and its use can be as simple as holding a staff meeting/public forum/town hall meeting, sending out a mass e-mail, adding it to a website, or putting an announcement in a newsletter or local publication.
- II. Remember to add the AED information to your staff training program and facility information.

- III. If you move your facility's AED for any reason, you must let everyone involved know, including State AED Registry.

1.9.2. System of Maintenance

An AED device maintenance system/process should include the following:

- i. Daily Routine inspection of device to ensure that it is ready for use.
- ii. Perform monthly maintenance inspection according to the maintenance check list. (*appendix 01*).
- iii. Display/indicate the expiry date of electrode pads on AED device properly.
- iv. Display contact number of Site Program Manager/person in charge and AED maintenance support on the AED and cabinet display
- v. Ensure constant supply of accessories as necessary: contact device manufacturer and change expired accessories (pads, batteries, rescue accessory kit)
- vi. After use of device, clean and disinfect the unit (based on AED manufacturer's recommendations)
- vii. Site Program Manager/person in charge must report any defective or missing AED to State AED Registry and arrange for replacement or repair.
- viii. Ensure post incident procedure are adhered to.

2.0. Emergency Response Plan

The emergency response plan is detailed as below:

- I. When there is a medical emergency in the facility, bystander should call 999 immediately
- II. Identify the need for CPR and use of AED in victim who have no signs of life
- III. Provide vital information to the emergency help operator: type of emergency, address of facility, location of collapse, phone number.
- IV. Start hands-only CPR and retrieve the nearest AED device
- V. Continue CPR and follow AED instructions until arrival of the ambulance team and medical help or victim regain return of spontaneous circulation (ROSC)

3.0. Post-Incident Procedures

After AED has been retrieved and used, medical facilities receiving the victim with the used AED shall **sanitize** the AED before contact the program manager/person in charge to arrange for the return of the AED to original premises within 24 hours.

Upon receiving of the returned AED, these post-incident procedures should be followed:

- I. Check the device to ensure it has reverted back to original working condition
- II. Replace electrode pads, replace/recharge batteries and rescue accessory supplies (e.g. scissors, wipes, gloves, razors, masks, etc.)
- III. Check expiry date on fresh electrode package
- IV. Check the device is ready for use again with the indicator showing correct sign
- V. Contact device manufacturer to retrieve rescue data from the device if available and forward to medical facilities receiving victim and another copy to National AED Registry

References

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8. <https://www.zoll.com/medical-technology/cpr>
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Appendix

Automated External Defibrillator

Maintenance Checklist

Date _____ Location : _____

Inspection performed by: _____

Criteria		Status	Corrective Action/Comments
A	AED		
1	Placement visible, unobstructed and near phone (if possible)		
2	Verify battery installation		
3	Check the status/service indicator light		
4	Verify absence of visual/audible service alarm		
5	Clean, no dirt or contamination; no damage present		
B	Supplies		
1	Two sets of AED pads in sealed package		
2	One set of pediatric pads (if necessary)		
3	Check expiration date on pad packages		
4	Pocket mask with one-way valve		
5	Examination gloves		
6	Scissors		
7	Razors		
8	Absorbent gauze or hand towels		
C	Additional requirements from AED manufacturer		

Please refer to manufacturer's User Manual for more information and proper annual maintenance procedures.

GLOSSARY

Short Name/ Term	Description/ Definition	
CPR	Cardiopulmonary resuscitation	
AED	Automated External defibrillator	
PAD	Public Access Defibrillator	
OHCA	Out Of Hospital Cardiac Arrest	
SCA	Sudden Cardiac Arrests	
SCA	Sudden cardiac arrest	
CAD	coronary artery disease	
LED/LCD	light-emitting diodes/ Liquid-crystal display	
MDA	Medical Device Authority	
ERT	Emergency Response Team	
ROSC	Return of spontaneous circulation	

01 – AED signage



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