

Course title

Compression-only Cardiopulmonary Resuscitation Student Training Course

Course description

Compression-only cardiopulmonary resuscitation (COCPR) is a life-saving skill that should be learned by every member of the community. Scientific studies have shown that CPR performed by a bystander can increase the chance of survival of a victim of sudden cardiac arrest. This Course is designed to equip a potential lay responder to sudden cardiac arrest with the knowledge and skills necessary for delivering COCPR according to the 'Compression-only CPR Training Program for Secondary School Students' organized by the Emergency Medicine Unit of the University of Hong Kong.

Course objectives

This Course aims to:

1. introduce the principles of COCPR
2. illustrate the technique of performing COCPR

Course content

Session 1: COCPR: a re-cap

Session 2: Hands-on practice

Session 3: Assessment

Course learning outcomes (CLO)

On completion of this Course, students should be able to

1. understand the principles of COCPR
2. demonstrate the 4 C of COCPR

Course teaching and learning activities

This is primarily a practical session to reinforce the principles and practice of COCPR for an adult with sudden cardiac arrest to the students. Students will be given a manikin to practice COCPR. The whole practice process is integrated with face to face coaching by an instructor. The Course is concluded by an assessment of student's skills in performing COCPR on a manikin.

Course assessment method

Students are required to demonstrate COCPR on a manikin based on the 4 C procedure: check, call, compress and continue. Their demonstration lasts 1 minute. The instructor check the correctness of the student's performance according a set of pre-defined criteria. To pass this part, the student has to satisfy all criteria. The need for remediation will be determined by the instructor.

Individual session (duration of each session is flexible)

Session 1	COCPR: a re-cap (refer to notes to lead instructor)
Mapping CLO	1
Session learning outcomes	On completion of this session, the learner should be able to: <ol style="list-style-type: none">1. appreciate the purpose of COCPR2. explain the steps of COCPR

Session 2	Hands-on practice
Mapping CLO	2
Session learning outcomes	On completion of this session, the learner should be able to: <ol style="list-style-type: none">1. identify the need to perform COCPR2. demonstrate how to perform COCPR

Session 3	Assessment
Mapping CLO	1, 2
Session learning outcomes	On completion of this session, the learner should be able to: <ol style="list-style-type: none">1. perform COCPR to an adult victim of sudden cardiac arrest in real life2. appreciate the usefulness and limitation of COCPR

Reminders to lead instructor

1. Inform teacher(s):

- To distribute the teacher's survey questionnaires to all teachers of the school and place the completed questionnaire in the designated box. Staff from the EMU will collect the box about 2 weeks later.
- To allow students as much time as possible to practice COCPR on the manikin provided together with the use of the CPR app in school.
- To encourage students to practice with the CPR app outside school hours as often as possible. The school with the highest number of 'A' students will win a special prize.

2. Explain the usefulness of COCPR with a simple scenario: a man suddenly collapses on the street or in a mall and you witness his collapse.

3. Briefly explain the CPR app.

4. Emphasize the 4C (check, call, compress, continue) and the characteristics of quality chest compression.

5. Explain the assessment method

- On-site demonstration of the 4C and characteristics of quality chest compression
- Completion of the e-learning module
- Attaining a satisfactory result (Grade C or above) of COCPR as recorded by the CPR app within 1 month from class

Reminders to other instructors

1. Download the CPR app and AED app * onto your mobile phone. In this class, we mainly use the CPR app
2. Take charge in the practice and assessment session
3. During the practice session:
 - Demonstrate the 4C (check, call, compress, continue) and what quality chest compression is.
 - Each student should practice COCPR (4C and quality chest compression) on the manikin as many times as time allows. The CPR app can be used at the same time. Beware that practice is not distracted by the use of CPR app.
 - Instructor should point out student's mistakes and correct them immediately. There is not enough time for a separate session of Q&A.
4. During assessment,
 - Each student is required to perform COCPR on the manikin. Use the assessment form provided for marking.

* For AED app download:

Google Play用戶



App Store用戶



Compression-only cardiopulmonary resuscitation: background, principles and practice

Content

Sudden cardiac arrest

- What is it?
- What are the causes?
- Are there any risk factors or red flags?
- What is the magnitude of the problem?

Strategies to manage sudden cardiac arrest

- The chain of survival
- Evolution of cardiopulmonary resuscitation
- Compression-only versus traditional cardiopulmonary resuscitation

Compression-only cardiopulmonary resuscitation

- How does it work?
- How to do it?
- How to do it properly?

Sudden cardiac arrest

What is it?

Sudden cardiac arrest (SCA) occurs when the heart stops beating suddenly and unexpectedly. When the heart is not beating, blood flow to the organs also ceases. As a result, all organs are deprived of oxygen and the essential substrates that are required to maintain life. Cells of the brain and the heart are very vulnerable to lack of oxygen. If intervention to resume blood flow is not instituted promptly, death becomes inevitable.

SCA can occur inside or outside the hospital setting. In-hospital cardiac arrest is often a complication or the final common pathway of a disease. People commonly affected are usually those hospital patients with terminal illness e.g. late stage of cancer or advanced heart failure refractory to treatment. On the other hand, out-of-hospital cardiac arrest refers to SCA that occur in the community setting. The setting could be the person's home or workplace. Not uncommonly, it may occur while the person is walking on the street. What's worse, SCA often set in with no or little warning.



Sudden cardiac arrest occurs when the heart stops beating abruptly.



Out-of-hospital cardiac arrest can occur anywhere e.g. in a park.

Sudden cardiac arrest

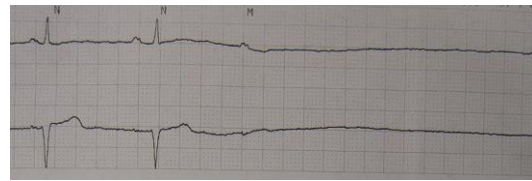
What are the causes?

The immediate cause of SCA is an abnormality of the heart beat rhythm, or an arrhythmia. There are three types of arrhythmia that lead to SCA i.e. asystole, pulseless electrical activity (PEA) and ventricular fibrillation (VF). All three are a result of an abnormality of the electrical system of the heart. In asystole, the person's electrocardiogram appears as a straight line. In PEA, the electrocardiogram shows some electrical activity of the heart but mechanically there is no output of blood flow from the heart. In VF, the electrical activities of the heart cells is completely disorganized and there is no effective heart beating to generate blood flow.

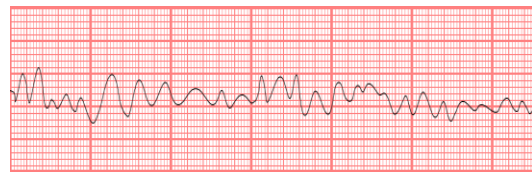
There are multiple causes of these three arrhythmias. In general, coronary artery disease (CAD) is of particular importance. Coronary artery disease refers to the condition in which there is insufficient blood supply to the heart muscles because of narrowing of the coronary vessels. If the insufficiency is so severe that the heart muscle cells die, an infarct or commonly called a heart attack occurs.



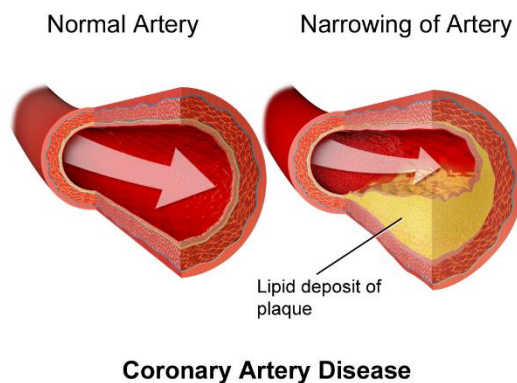
Asystole



Pulseless electrical activity



Ventricular fibrillation



Sudden cardiac arrest

Risk factors

The risk factors of sudden cardiac arrest are essentially the same as those of CAD. This reflects the close relationship between the two.

1. Smoking
2. Hyperlipidemia
3. Hypertension
4. Diabetes mellitus
5. Obesity
6. Lack of physical exercise

Risk factors of sudden cardiac arrest

Red flags

By definition, sudden cardiac arrest occurs unexpectedly and suddenly. There are often no identifiable red flags. However, sudden cardiac arrest is a result of an arrhythmia. There are chances that initially the arrhythmia may not be serious enough to cause a complete cessation of blood flow from the heart but only a reduction of it. This can occur if the heart beat is either too fast or too slow. Recurrent dizzy spells or loss of consciousness may then constitute a warning symptom. For those persons with known CAD, an alarm is raised if there is increase in the severity or frequency of symptoms like chest pain. This suggests that the narrowing of the coronary vessels has reached a critical stage. Urgent medical attention must be sought in this situation.

- Chest pain or tightness
- Sudden shortness of breath
- Sudden nausea with excessive sweating
- Unexplained dizziness
- Loss of consciousness
- Unexplained palpitation

Red flags of SCA. Very often there is no red flag.

Sudden cardiac arrest

What is the magnitude of the problem?

SCA in the out-of-hospital setting is a major global health problem. The average incidence of adult SCA globally is estimated to be 55 per 100,000 person-years. Every year, more than 7 million people die of SCA. In the US, there are 250000 to 450000 cases annually. In Hong Kong, 5000 to 6000 cases occur every year. The probability of a person suffering from SCA who can survive to hospital discharge is about 2.3%. This rate is among the lowest in the world.

SCA is more common among the senior citizens in Hong Kong. About 75% of cases are people older 65 years. This is not surprising as more elderly people have chronic illnesses like coronary artery disease. The survival rate of this elderly population is worse. Their probability of surviving to hospital discharge is only 1.5%. However, various clinical studies have found that age itself is not an independent predictor of prognosis. In other words, if prompt intervention is provided, the elderly with SCA may have a similar chance of survival as the young.

In Hong Kong:

There are 5000 to 6000 cases of SCA each year.

Only 1 out of 44 persons with SCA can survive to hospital discharge.

3 out of 4 persons with SCA are older than 65 years.

Among the elderly, only 1 out of 67 persons can survive to hospital discharge.

Important statistics of SCA for Hong Kong

Strategies to manage sudden cardiac arrest

The chain of survival

The chain of survival is an important concept related to saving the life of someone with SCA. There are five links in the chain. They are:

1. Early recognition and activation of the emergency medical service.
2. Early high-quality cardiopulmonary resuscitation (CPR).
3. Early defibrillation.
4. Basic and advanced emergency medical services.
5. Integrated post-arrest care.

In communities with a strong chain of survival, the chance of survival and recovery for persons suffering from SCA is better.

Community has the biggest role in the first 3 links. Bystander-initiated CPR before the arrival of the emergency medical service can increase the chance of survival up to 3 times among victims of SCA in comparison to those without such assistance.



The chain of survival

- * Dial 999 *at once*.
- * Start CPR *before* the ambulance arrives.
- * Attempt defibrillation with an automated external defibrillator or AED, if available, *before* the ambulance arrives.

Actions by a witness of out-of-hospital cardiac arrest

Strategies to manage sudden cardiac arrest

Evolution of cardiopulmonary resuscitation (CPR)

Our attempts to revive a life can be dated back to the 16th century when Vesalius gave breath to a dying animal through a reed placed in its trachea. In the 1700's, Tossach gave the first documented 'rescue breath' to a worker of a coal mine who had inhaled toxic fumes in the mine. After this attempt, the Academy of Sciences of Paris recommended mouth to mouth breathing to resuscitate a drowned victim. Thereafter, mouth to mouth breath has become the most widely practiced technique for resuscitation.

The first successful chest compression was performed by Dr. George Crile in 1903. Almost 50 years later, Dr. William Kouwenhoven, Dr. Guy knickerbocker and Dr. James Jude described the benefits of closed chest compression by which they successfully saved a woman from death. They also recommended that mouth to mouth breathing and closed chest compression should be practiced together. This lay the foundation of modern CPR.



A student in a CPR class practicing mouth to mouth breath on a manikin



Another student practicing chest compression

Strategies to manage sudden cardiac arrest

Compression-only versus conventional cardiopulmonary resuscitation

Conventional CPR involves a combination of mouth to mouth breath and chest compression. The ratio of breath to compression is 2 to 30. That is, you give 2 breaths followed by 30 chest compressions. You repeat the cycle until the ambulance crew takes over or the victim's condition improves e.g. when you can feel a pulse or you find spontaneous movement or breathing of the victim.

Compression-only CPR, as its name implies, involves chest compression without mouth to mouth breathing. For compression-only CPR, you should perform continuous chest compression at a rate of 100 to 120 per minute. You do not have to give mouth to mouth breathing to the victim.

Clinical studies have found that in adults with SCA, compression-only CPR is as efficacious as the conventional CPR. In addition, because there is no need to perform mouth to mouth breathing, compression-only CPR is more acceptable to the public who may worry about the transmission of infectious diseases through mouth to mouth contact. Further, because one only needs to do the chest compression at a specific

rate, the technique is more easily learned and practiced by laypersons.

However, there are situations where compression-only CPR is not recommended and full CPR should be performed. The purpose of doing chest compression is to take over the pumping function of the heart (of course, to a limited extent only) to circulate oxygen in the blood to the body organs. Therefore, compression-only CPR should not be used to resuscitate someone whose body oxygen has been depleted. A typical example is a drowned person. Conventional CPR combining chest compression and rescue breath should be used. Another similar situation is that the person, when found, is already unconscious or not breathing normally. Their oxygen reserve is expected to be extremely low. In infants or children, their SCA is often a result from a lung problem e.g. choking or severe asthma, which may have used up their oxygen in the body. Therefore, infants and children in cardiac arrest require conventional CPR.

Compression-only CPR is NOT recommended in:

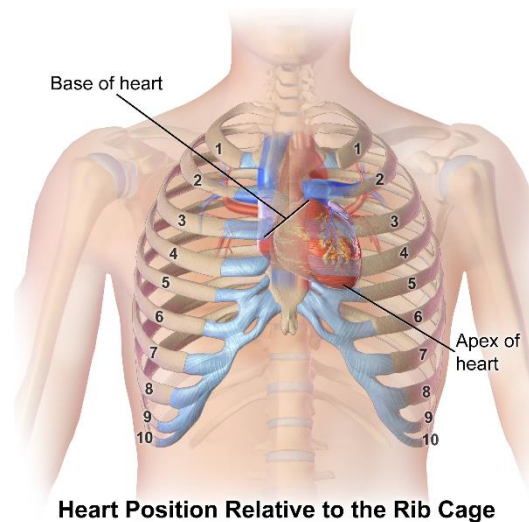
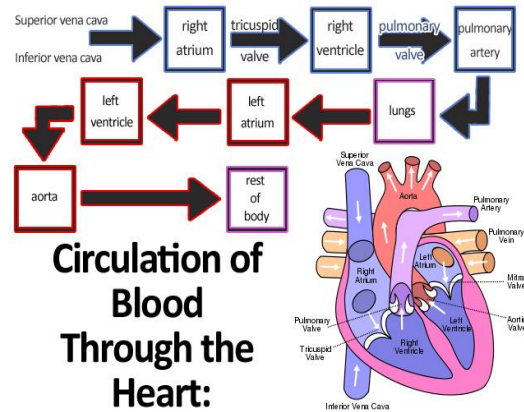
1. SCA due to drowning
2. adults who have been unconscious or not breathing normally for some time
3. infants and children with SCA

Compression-only cardiopulmonary resuscitation

How does it work?

The main purpose of doing CPR in a person whose heart has stopped beating is restore the flow of blood so that oxygen (and other nutrients) can be circulated to the organs while the metabolic wastes can be transported away from them. There are two theories that explain how chest compression can achieve this purpose: the cardiac pump theory and the thoracic pump theory.

The cardiac theory postulates that blood flows because the heart is squeezed between the sternum and the spine during chest compression. The thoracic pump theory postulates that blood flows from the thoracic cavity because the pressure inside the thoracic cavity is greater than the pressure inside the blood vessels outside the thoracic cavity. Blood can only flow forward because backward flow is restricted by the valves inside the blood vessels (the veins). In real life, both theories play a role in chest compression CPR and they are not mutually exclusive.



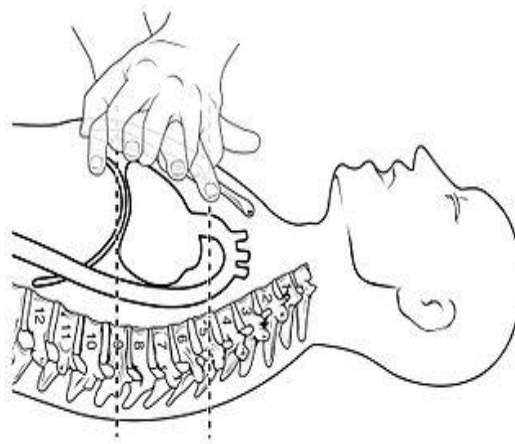
Compression-only cardiopulmonary resuscitation

How to do it?

If you witness a SCA in an adult, take these 2 steps after ensuring your own safety:

1. Dial 999 or ask somebody to do that.
2. Start chest compression by pushing hard and fast in the centre of the chest of the victim.

Continue until help arrives or until the victim moves or otherwise responds.



How to do it properly?

You should	You should not
Compress at a rate of 100 to 120 per minute	Compress at a rate faster than 120 per minute or slower than 100 per minute
Compress to 5 cm to 6 cm deep	Compress deeper than 6 cm or less than 5 cm
Allow full recoil between compressions	Lean on the chest between compressions
Minimize interruption of compressions	Pause more than 10 seconds

Notes:

Compression-only CPR

(For witnessed sudden collapse of an adult)

1. Check 2. Call 3. Compress 4. Continue

Ensure the environment is safe for you, the victim and any bystander.	
Check the victim and call for help. a. Tap the shoulder and shout, ‘Are you okay?’ and quickly check for breathing. b. If there is no response, no breathing or abnormal breathing, call for help and dial 999.	1 2
Begin chest compressions. a. Place the heel of one hand on the center of the chest. b. Place the heel of the other hand on top of the first hand and interlock fingers of both hands. c. Keep the arms straight, position your shoulders directly over your hands. d. Push hard, push fast. ✓ Compress the chest at 5 – 6 cm deep. ✓ Compress at 100 – 120 times per minute. ✓ Let the chest rise completely before pushing down again.	3
Continue until e. the EMS or another rescuer arrives. f. there are signs of life e.g. spontaneous breathing. g. you are too exhausted. h. an AED arrives. i. the environment becomes unsafe.	4

Compression-only CPR: skills evaluation

Student name: _____ Date: _____

Result: Pass Need remediation

Skill	Critical performance criteria	Tick if done correctly	For remediation use
	Environment safety and self, victim and bystander safety		
1. Check	Assess victim status		
2. Call	Yell for help Dial 999 (or ask someone to do so)		
3. Compress	Hand placement (centre of chest and lower half of breast bone) Arms straight Compression rate 100 – 120 per minute Compression depth 5 – 6 cm Complete chest recoil between compressions		
4. Continue	Minimal interruption		

Observe for *1 minute*.

If the student completes all steps successfully (a ✓ in each box to the right of Critical Performance Criteria), the student passed the test.

- If the student does not complete all steps successfully (as indicated by a blank box to the right of any of the Critical Performance Criteria), give the form to the student for review as part of the student’s remediation.
- The instructor can determine alone or after consulting the lead instructor whether the student is required to repeat the test.

Instructor: _____ Remediation result: Pass Fail (Date: _____)