

## Chapter 42

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# RESUSCITATION REVIEW

It is not possible to learn the techniques of resuscitation from a book. To acquire these skills, the authors recommend that all divers undertake a resuscitation course from one of the many organisations worldwide which teach these techniques. Once learnt, the skills need to be practised regularly, just as do diving emergency procedures.

The protocol used here is meant as a reminder to divers who have already been trained in resuscitation. It is based on the basic life support (**BLS**) recommended by the Australian Resuscitation Council <<http://www.resus.org.au/>>. Organisations in other countries may have slightly different protocols, but if from reputable organisations they should be equally effective.

### WHAT IS RESUSCITATION?

Resuscitation is the restoration or preservation of life using **basic life support (BLS)**. This includes the A-B-C — Airway, Breathing, and Circulation — to preserve oxygenation to vital tissues. The most important tissue to protect from hypoxia is the brain.

Expired Air Resuscitation (EAR) is usually the best method of initially ventilating the lungs. If the rescuer has the equipment and skill to ventilate the victim with an Oxygen Resuscitator, then that is preferable for diving accidents.

### ASSESSMENT OF THE DIVING CASUALTY

## **D and R - DANGER and RESPONSE**

### **DANGER**

It is important to protect yourself, others and the victim from further injury. It includes retrieval of the victim from a drowning or hypothermic situation, protection from marine animal injuries (shark attack, chironex tentacles etc.) and avoidance of physical trauma from boats, surf etc.

### **RESPONSE. Is the Victim Conscious?**

Most problems arise in an unconscious victim. If the victim appears unconscious, confirm this by shouting at him and squeezing the shoulder. If the victim does not respond, he is probably unconscious. If the victim is **conscious** he will normally take care of his own airway and breathing.

Exceptions to this are the sea snake, blue ringed octopus or box jellyfish (Chironex) envenomation, where the victim may be conscious but paralysed. In these cases the victim will not respond to shouting, so the management for an unconscious victim (which is appropriate) will be undertaken.

If the victim is **unconscious** he will be in danger of hypoxic hypoxia from obstruction of the airway or inhibition of breathing, or of stagnant hypoxia from lack of circulation (see Chapter 20).

**With an unconscious victim**, take care of the following systems:

- **AIRWAY**
- **BREATHING**
- **CIRCULATION**

**This is easily remembered by the mnemonic — A-B-C.**

Maintenance of airway, breathing and circulation takes precedence over other forms of care. Without these functions, the victim is certain to die.

## **A — AIRWAY**

An unconscious victim loses muscle control. Loss of control of the muscles of the throat and tongue can cause the airway to become obstructed. This is particularly likely when the victim is lying on his back, mainly due to the tongue falling backwards into the throat, due to gravity.

The airway can be further obstructed by vomit, saliva or foreign material. This would normally be swallowed or spat out by a conscious person, while any material which entered the larynx or trachea would elicit the reflexes of coughing and laryngeal closure. These reflexes may be lost in the unconscious patient.

## Clear the airway

Cases of **near-drowning**, and other unconscious victims rescued from the ocean, are probably best managed initially with the victim on his side.

To prevent airway obstruction, turn the victim on his side (left side down for gas embolism).

Sweep any foreign material from the mouth with the fingers.

Position the mouth slightly downward to allow any fluid to drain out. (In these cases, there is frequently fluid, vomit or other material in the airway).

The side (lateral) position with the mouth turned slightly downward will help any fluid to drain from the airway.

In **other cases**, and after clearing the airway of obstructions, secure the airway with the victim on their back. (See the chapter on pulmonary barotrauma for special considerations in this condition).

**Tilt the head backwards**, to open the airway, if necessary apply the chin lift maneuver (taught in resuscitation courses) if the airway remains obstructed. If there is a possibility of spinal injury, further injury by unnecessary movement of the spine should be avoided when positioning the patient, but clearing the airway takes precedence.

## B – BREATHING

Even with a clear airway the victim may not breathe because of respiratory muscle paralysis, cerebral injury, hypoxia, cardiac arrest or other reasons.

### Check for breathing – look, listen and feel.

Look and feel for respiratory movements of the chest and abdomen. Listen and feel for air moving from the nose and mouth. Occasional gasping respirations should be treated as not breathing.

If the victim is making respiratory movements ensure that the airway is clear.

### Recognition of airway obstruction

If the airway has been cleared of foreign material, it can still be obstructed.

Signs of **obstructed airway** are snoring sounds, crowing sounds or movements of the chest and abdomen with no air moving from the nose and mouth.

If there is airway obstruction, look to improving the head tilt and chin lift maneuver.

If the victim is breathing, put him or leave him on his side (coma position) and keep the airway clear.

### If the victim is not breathing:

### Turn onto the back, commence expired air resuscitation (EAR).

The theory and practice of this are covered in a resuscitation course. The steps are:

- clear the airway
- tilt the head back, apply chin lift
- use mouth to mouth or mouth to nose expired air resuscitation
- look for the chest rising with each breath (if it is not, clear and open the airway)
- look, listen and feel for exhalation

If the rescuer has the equipment and skills, help secure the airway using an airway device (eg guedel airway), and ventilate using mouth to mask, a self inflating bag (eg Ambubag) with or without oxygen, or an oxygen inflating device ( eg Oxyviva).

Give two full inflations of one second each then:

### **Check the circulation**

<h2><b>C – CIRCULATION</b></h2>
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If the victim is unconscious, unresponsive and not breathing it can be assumed that there is no circulation and external cardiac compression (ECC) should be started (Australian Resuscitation Council recommendation).

Note: Previous protocols recommended feeling for a pulse at this stage. This has now been omitted as it is often difficult to feel a pulse in these circumstances, even by medical personnel, and feeling for a pulse and then deciding there is none delays the start of life saving ECC.

Advanced resuscitators such as doctors or paramedics may check for circulation by feeling for a carotid pulse before commencing ECC. But this may be unreliable even in experienced hands and no more than 10 seconds should be used checking for a pulse. If there is no pulse, or any doubt, commence ECC.

When there is no circulation, the sooner ECC is commenced, the better the outcome.

### **Commence external cardiac compression (ECC) and Cardiopulmonary Resuscitation (CPR)**

**External cardiac compression.** Circulation sufficient to keep the victim alive can be restored with this technique. The chest is compressed by pressure on the sternum, forcing blood into the major arteries and producing some circulation to the vital organs. It takes numerous compressions to establish a blood pressure adequate to provide circulation. If compressions are stopped, the blood pressure immediately falls and the process has to be restarted. Thus the number of times compressions are stopped should be minimized.

The combination of artificial respiration and external cardiac compression is called CPR. This is performed as follows.

# CARDIOPULMONARY RESUSCITATION (CPR)

When the heart stops, so does the breathing (except for occasional gasping respirations in some cases). It is necessary to maintain respiration and cardiac function simultaneously. CPR is EAR and ECC combined.

**Give two EAR (expired air resuscitation) breaths of one second per inspiration each, then**

**Start external cardiac compression (ECC)**

Practical details of this are covered in a resuscitation course. Remember, compress:

- vertically
- over the lower half of the sternum (the centre of the chest)
- with the heel of the hand, both hands locked together
- with no pressure on the ribs
- to a depth of 4–5 centimetres (1.5–2 inches or 1/3 the depth of the chest) in adults
- a rate of 100 per minute (almost 2 per second)
- time of compression equal to relaxation – allow complete relaxation

## **CPR with one rescuer**

2 respiratory inflations to 30 cardiac compressions.

## **CPR with two rescuers**

2 respiratory inflations to 30 cardiac compressions

Co-ordinate the inflation with the relaxation phase of compressions. Pause the compressions to allow the inflations.

Continue ventilation and chest compressions at a 30 to 2 ratio until the patient recovers.

Do not stop resuscitation to check for signs of life. If the victim recovers it should be obvious.

If multiple rescuers are present, rotate chest compression duty every 2 minutes as it is very tiring.

If rescuers are unable or unwilling to give expired air resuscitation, chest compressions alone are better than nothing.

## **Duration of CPR**

Continue CPR until:

signs of life return  
more qualified help arrives  
rescuers are exhausted.  
an authorized person pronounces the patient dead.

## **Recovery checks**

Frequent recovery checks (stopping cardiac compressions to feel the pulse) are no longer considered appropriate. Interruptions to cardiac compressions result in a poor outcome. Lay people often have difficulty feeling a pulse. Continue CPR until there are signs of life.

# **D – AUTOMATIC DEFIBRILLATION**

**If an AED (Automated External Defibrillator) is available  
attach it and follow the prompts.**

Some causes of cardiac arrest (e.g. ventricular fibrillation) can be fixed by giving an electrical shock through the chest.

An AED can analyse the cardiac electrical activity and automatically give a shock if appropriate.

If required, the AED should be used as soon as possible after initial CPR.

CPR should be continued until the AED is attached.

If the device detects a shockable rhythm and delivers a shock, CPR should be continued for a further two minutes - the heart takes a few minutes to recover its strength. The machine should then be used to recheck the rhythm.

**BASIC LIFE SUPPORT (BLS)**

Using the mnemonic, **DRABCD** stands for:

**D** Danger – always check the danger to you, any bystanders and then the injured or ill person. Make sure you do not put yourself in danger when going to the assistance of another person.

**R** Response – is the person conscious? Do they respond when you talk to them, touch their hands or squeeze their shoulder?

**A** Airway – can the person breathe? Is their airway clear?  
If the person is responding, they are conscious and their airway is clear. Assess how you can help them with any injury.

If the person is not responding, they are unconscious. You need to check their airway by opening their mouth and having a look inside. If the mouth is clear, tilt their head gently back (by lifting their chin) and check for breathing. If the mouth is not clear, place the person on their side, open their mouth and clear the contents. Then tilt the head back and check for breathing.

**B** Breathing – check for breathing by looking for chest movements (up and down). Listen by putting your ear near their mouth and nose. Feel for breathing by putting your hand on the lower part of their chest or against your cheek.

**C** CPR (cardiopulmonary resuscitation) – if the person is not breathing, place them flat on their back. Tilt their head back gently by lifting their chin. Pinch their nostril closed, place your open mouth firmly over their open mouth and give them 2 breaths – one after the other. Stop. Check for signs of life. If there are none, commence compressions on the chest. Place the heel of one hand in the centre of their chest and your other hand on top. Press down firmly and smoothly (compressing to one-third of their chest depth) 30 times. Give 2 breaths. Keep going until medical assistance arrives.

**D** Defibrillator – use a portable defibrillator (if you have one). This is a machine that applies electrical therapy to overcome irregular heart beat (arrhythmia), allowing the heart to re-establish an effective rhythm. Be sure to follow the instructions and picture on the machine and on the package of the pads as well as the voice prompts. If the person responds to defibrillation, follow the DRABCD Action Plan.