



Australian Resuscitation Advisory Network

BLS Guideline 3 – **COMPRESSIONS**

Scope

Who does this guideline apply to?

This guideline applies to all persons who are unresponsive to pain and present with absent or abnormal breathing.

Who is the audience for this guideline?

This guideline is for use by BLS first responders, including bystanders, first aiders, and health professionals away from a clinical setting.

Age Classifications for Resuscitation

For the purposes of resuscitation:

- **Adult** is defined as a person > 8 years of age i.e. 9 or above or a person who physically appears to be that age e.g. an 8 year old child that weighs 70kg would be classified an adult because of physical appearance.
- **Child** is defined as a person between the ages > 12 months and ≤ 8 years old or a person who physically appears to be that age.
- **Infant** is defined as a person between the ages of 0 and ≤ 12 months or a person who physically appears to be that age e.g. a premature infant of 15 months of age, may be a similar size and weight to an 11 months old infant and therefore this person would be classified an infant.

Recommendations

The Australian Resuscitation Advisory Network (ARAN) makes the following recommendations:

1. As a minimum, all rescuers should perform chest compressions for all persons who are unresponsive to pain and not breathing normally.
2. Interruptions to chest compressions should be minimised.
3. Deep, fast compressions can assist in emptying the heart of old venous blood, which can interfere with the function of the heart if a heartbeat is restored.
4. The main mechanism of action of chest compression is to change the pressure inside the chest (inter-thoracic pressure), thus pressurising the aorta and moving a small amount of blood to perfuse the heart and brain.

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General Principles

All rescuers, (including health care professionals), should use lack of response to pain and absence of breathing/ or abnormal breathing as the indication for resuscitation. The presence or absence of a palpable pulse is an unreliable indicator for the need for resuscitation. This is particularly true of pulses in children and infants, which due to hypoxia can be very slow and faint. With the absence of normal breathing, a cardiac arrest is imminent anyway and therefore compressions are indicated.

Method

Locating the Site for Chest Compression on Adults

Adult - Performing chest compressions on the lower half of the sternum (Figure 1)

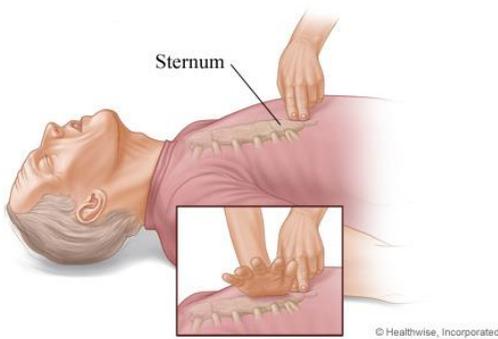


Figure 1 – Chest Compression location -Adult

Expose the chest and locate the lower end of the sternum (breastbone) with the fingers. The end is adjacent to where the lowest ribs meet in the centre line of the chest. Leave one or two fingers on the end and position the heel of the hand in the "dish shaped" sternum. Avoid compression beyond the lower limit of the sternum. Compression applied too high is ineffective and if applied too low may cause regurgitation and/or damage to internal organs.

Children and Infants – perform compressions on the centre of the sternum. This equates to the nipple line. Expose the chest and locate the nipple line. Place the heel of one hand in the "dish-shaped" sternum.

Method of Chest Compressions

There are a variety of methods for applying chest compressions. Which method is appropriate will depend on the size of the person needing resuscitation and the ability of the rescuer.

A person requiring chest compressions should be placed on their back on a firm surface (e.g. backboard or floor) to optimize the effectiveness of compressions. Compressions should be rhythmic with equal time for compression and relaxation. The rescuer must avoid either rocking backwards and forwards, or using thumps or quick jabs. Rescuers should allow complete recoil of the chest after each compression.

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Adult

Whilst there are many references and pictures of adult compressions being performed with an interlocking fingers technique there is no evidence that this is the ideal technique. The origins of this technique were an attempt to minimise rib fractures during resuscitation by keeping the fingers off the chest. As all the pressure of compressions is applied through the heel of the lower hand, lifting the fingers will not result in any reduction in complications. In practice, in adults, the force of compression required using this technique only serves to hyperextend the wrist and cause pain and/or injury to the rescuer.

A more effective technique to maintain depth of compression and avoid wrist injury/pain is pictured in Figure 2.

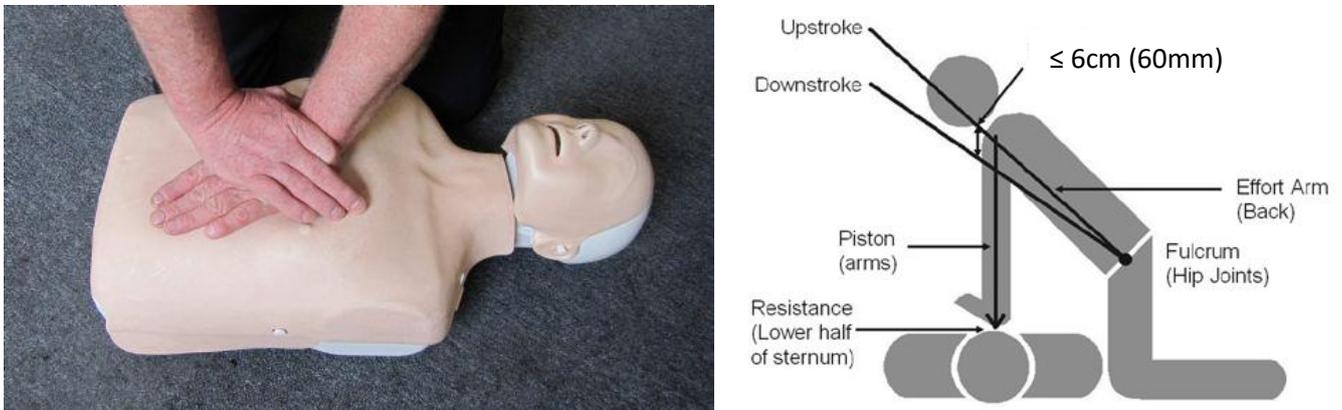


Figure 2 – Adult Hand Position

In this technique the thumb and index finger of the upper hand are wrapped around the wrist. This secures the upper hand in advent of sweating during compressions. The main advantage is the top hand splints the lower wrist and protects it against stress.

As less than half (46%) of adult rescuers (including health professionals) are able to achieve and maintain adequate compression depth on an adult person it is important to maximise the mass and strength of the rescuer, in that:

- The knees are positioned so that the thighs remain vertical during compressions.
- Movement is at the hips rather than the knees.
- Elbows are locked out
- Mass is kept over the centre of the chest

Children

Either one (Figure 3) or two hand (same as adult) can be used for compressions in children. The rescuer should use the technique that maintains adequate depth of compression.



Figure 3 – One Hand Technique

Infant

With infants there are four (4) techniques that can be used for compressions, depending on the situation. The first technique is the traditional two-finger technique (Figure 4). Although little research has been done to compare methods, there are several methods that are used and would seem superior to this method.



Figure 4 - Traditional Two-Finger Method

An alternative two-finger method that provides increased effectiveness whilst not increasing complications arising from compressions is pictured in Figure 5. In this method, the index finger is crossed under the thumb and the two-finger pad is used for compressions.

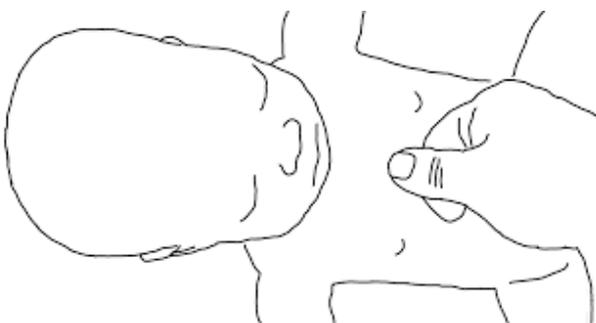


Figure 5 – Alternative Two-Finger Method

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The most effective technique (as used by Australian NICU's and AHA) is the two-thumb technique Figure 6. In this method the thumbs are used over the sternum and the hands encircle the chest and back. This allows chest compression from both sides.

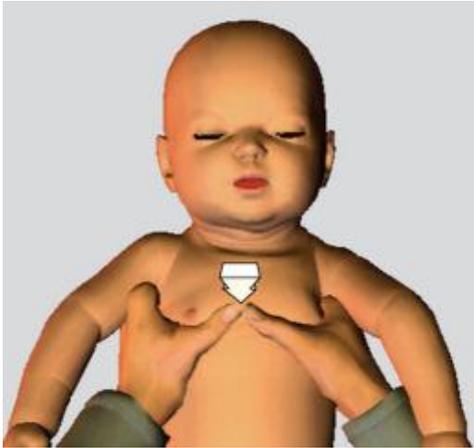


Figure 6 – Two-Thumb Technique

The final technique for babies is to do CPR with the child on your arm. In this method, the infant is laid on your forearm face-up with the head cradled in your hand to maintain the neutral head position. The baby's legs should fall each side of your arm i.e. the baby's crutch is up against the inside of your elbow. If your arm isn't long enough then just tuck both legs underneath your armpit and squeeze the legs to hold securely. In this position, the baby can be rolled to clear vomit, compressions using the new two-finger technique and ventilations can be performed. The benefit of this technique is that rescuer is now fully mobile to go to help while continuing resuscitation. In remote areas, it is possible to continue CPR while someone else drives to meet the Ambulance en-route.

Pregnant Person

In the heavily pregnant women (last 3 months of pregnancy), rescuers should place raise the right hip by tucking the person's right hand (palm up) under their right buttock i.e. the person is lying on their own arm. The reason for this position in pregnant women is to move the weight of the pregnant uterus off of her major blood vessels in the abdomen, that could be restricted should the person's heart function be restored.

Alternative Compression Method (Disability/Injury)

An alternative method for sole rescuers who have a disability (e.g. low upper body mass, weak erector muscles, arthritis of the hand or wrists, poor physical health) or an injury (e.g. back injury, amputee, knee or hip injury); is a method using the heel of the foot (Figure 7). Research indicates that when standing a rescuer has 20% more body mass available for compression and that "foot compressions" are the only technique (other than using a mechanical device) that can maintain adequate chest depth in prolonged CPR.

ARAN recommends that “Foot Compressions” is an effective as an alternative technique for chest compression. It may be used when the rescuer is unable to use their arms because of fatigue, injury, disability, when they lack sufficient body mass for traditional compressions to be effective or when the patient can only be reached with the rescuer’s leg.

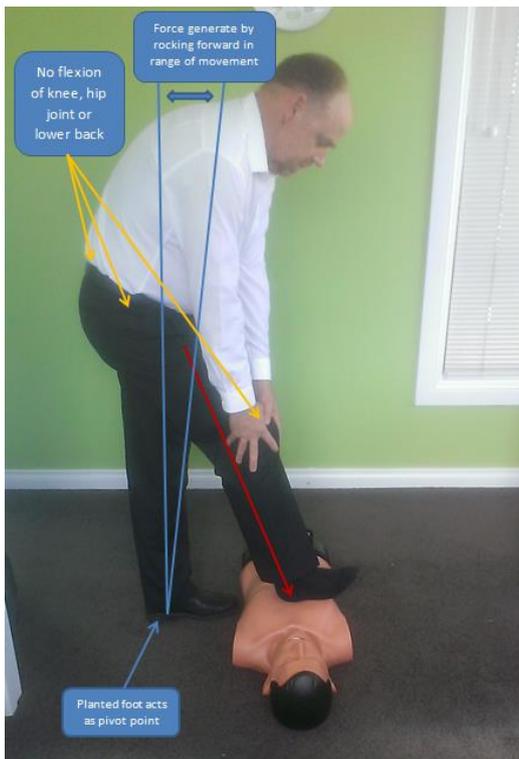


Figure 7 – Foot Compressions

Depth of Compression

Adult - The lower half of the sternum should be depressed $\leq 6\text{cm}$ (60mm) with each compression. In adults it is not possible to achieve depths equating to 1/3 of the depth of the chest (this 1/3 measurement is also impossible for the single rescuer to determine).

Child and Infant – In children and infants, it is possible to achieve 1/3 the depth of the chest of the person, however in the single rescuer situation this is impossible to assess. As a rule of thumb a simple calculation can be made based on an anatomical observation. Up to the age of approximately 6 years of age, a child's chest width and chest height are about equal. So all the rescuer has to do to calculate depth is to divide the child's chest width into thirds, this distance is then the approximate depth you need to push down. After around 7-8 years old and up to an adult the width of a patient's chest is twice the depth of their chest. So if we were to measure from the middle (sternum) to the side of the patient can be divided into thirds to calculate depth for that patient. This equates to approximately 4-5cm in children and 3-4 cm in infants.

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Rate of Compressions

ARAN recommends that rescuers should perform chest compressions for all ages at a rate of ≤ 120 compressions per minute (2 compressions/second).