SRFAC

BASIC CARDIAC LIFE SUPPORT + AUTOMATED EXTERNAL DEFIBRILLATOR

BCLS + AED

CONTENTS

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SECTION A

Cardiac Arrest and You

A-1: INTRODUCTION

Based on national health statistics from the Ministry of Health in 2015, Singapore, ischemic heart disease (lack of blood circulation to heart muscles) is the third most common cause of death, contributing to 16.7% of total mortality.

A person with heart disease is prone to a heart attack, which could result in cardiac arrest and sudden death. According to a 2015 study* conducted in Singapore, 2374 people collapsed in an out-of-hospital setting from sudden cardiac arrest, of which, 1656 (69.8%) occurred at home. Bystander CPR was performed on 1284 (54.1%) casualties and bystander defibrillation was performed on 97 (4.1%) of them. Only 77 (3.24%) casualties survived to be discharged with good-to-moderate neurological functions.

Survival from sudden death can be maximized with the prompt application of basic life-saving skills of cardio-pulmonary resuscitation (CPR) and use of automated external defibrillators (AEDs). These can be performed by any of us, anywhere and anytime. All that is needed are our two hands.

** Ong, M. E. H., et al. (2015). 2011-2015 Singapore Out-of-Hospital Cardiac Arrest Registry Report*

A-2: THE HEART, LUNGS AND CIRCULATION

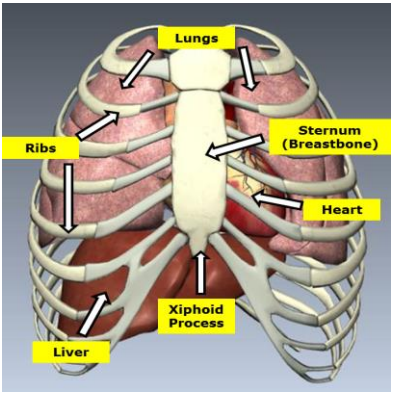


Figure A1 - The heart and lungs

The heart is a muscular pump located in the center of the chest and slightly towards the left (see figure A1).

The heart has two halves. The right side receives low oxygen blood from all parts of the body through veins and pumps it to the lungs via the pulmonary arteries to pick up oxygen (see figure A2).

The left side receives oxygen-rich blood from the lungs through the pulmonary veins and delivers it to all parts of the body, including the vital organs such as the heart, lungs, kidneys and brain.

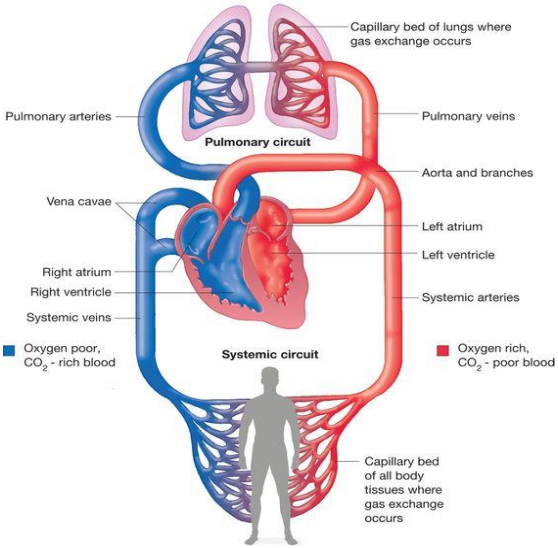


Figure A2 - The circulatory system

The heart muscles receive oxygen rich blood via a set of coronary arteries.

The pumping action of the heart is initiated by electrical signals from a pacemaker (sinoatrial or SA node), these signals travel to other parts of the heart in an orderly manner through a conductive network. The electrical signals from the heart can be picked up by an electrocardiogram (ECG) (see figure A3).

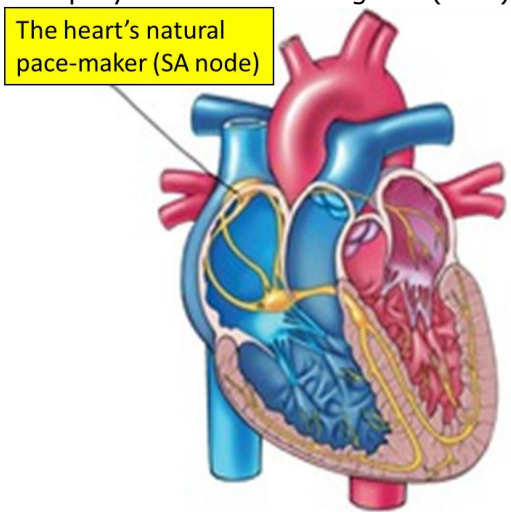


Figure A3 - The heart's electrical conduction

The pumping action gives rise to an organized heart-beat at regular rate of 60-100 beats per minute in a normal person.

On an ECG, normal heart rhythm, also known as the Normal Sinus Rhythm, appears as below (see figure A4):

Figure A4 - Normal Sinus Rhythm

The human body has two lungs which absorb oxygen from the air that we breathe. 21% of air consists of oxygen, of which 5% is extracted by the lungs. The extracted oxygen is passed to the blood within the capillaries of the lungs. The capillaries confluence into the pulmonary vein, which transports the oxygenated blood into the left side of the heart (see figure A5).

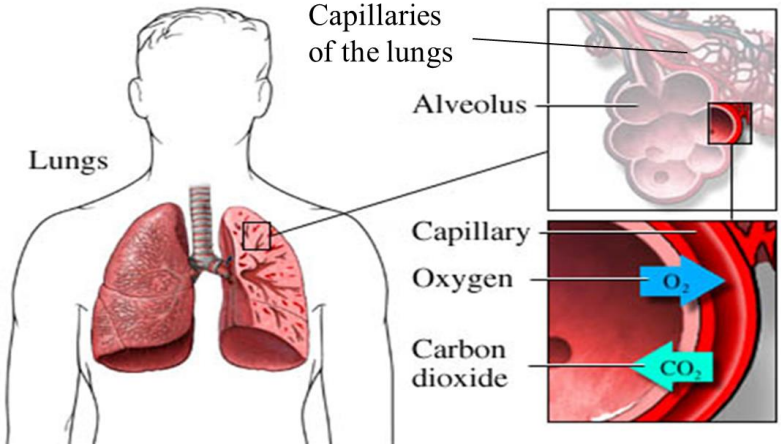


Figure A5 - Exchange of Oxygen and Carbon Dioxide in the lungs

The remaining 16% of unabsorbed oxygen is breathed out. This is extremely important in the context of mouth-to-mouth ventilation; the air that we ventilate into a cardiac arrest casualty can deliver sufficient oxygen to save and sustain life.

A-3: RISK FACTORS FOR HEART ATTACK

Survival rates of Sudden Cardiac Arrest is dismal even in the best cities. Prevention is of paramount importance to prevent heart attack from occurring. Several key risk factors contribute to the development of a heart attack. We can minimize the chance of getting a heart attack by controlling the risk factors. These are:

Smoking – Smoking promotes the development of plaques within the coronary arteries and increases the risk of heart attack by two-fold. This habit should be avoided altogether (see figure A6).

Figure A6 - Avoid smoking

Blood Pressure – If the blood pressure is high, there will be tremendous stress on the heart. Frequent blood pressure checks and reduction of salt in the diet is important. Those with high blood pressure should take their medicines and check their blood pressure regularly as instructed (see figure A7).

Figure A7 - Check your blood pressure regularly

Blood Sugars – Avoid a diet high in carbohydrates or refined sugars and control body weight through diet and exercise (see figure A8 and A9). If you have diabetes, take your medications regularly as instructed.

Figure A8 - Eat healthily

Blood Lipids - Manage blood lipids (fats) by avoiding foods high in fats. Doing regular exercise (see figure A9) could improve your blood lipid profile and take your medications regularly as instructed.

We all owe it to our families and loved ones to remove or minimize our exposure to these risk factors. Adopting healthy lifestyles by not smoking, eating foods in moderate amounts and regular exercise will decrease the risk of heart disease and other illnesses.

Figure A9 - Exercise regularly

A-4: WHAT HAPPENS IN A HEART ATTACK?

A heart attack occurs when cholesterol deposits and / or blood clots block one of the coronary arteries supplying the heart muscle (see figure A10). The heart muscles beyond the blocked vessel dies due to lack of oxygenated blood. This is heart attack.

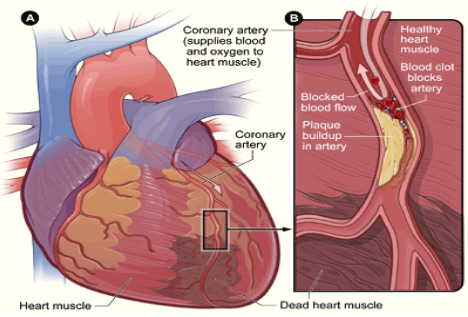


Figure A10 - Blocked coronary artery

Symptoms of a Heart Attack

A person who has a heart attack may experience any of these:

Pain – described as tightness or discomfort either over the chest or upper part of the abdomen (see figure A11). This pain may also spread to the left shoulder, left arm, neck or lower jaw. Some may mistake this for indigestion or fatigue.

Shortness of breath – A sudden difficulty in breathing may be a warning sign of a heart attack.

Other Symptoms - Sweating, nausea, vomiting or dizziness

If a heart attack is not treated promptly, deterioration of heart function will occur and the casualty may develop a sudden cardiac arrest.

Figure A11 - Pain or discomfort over the chest or upper abdomen

Learn to recognize the symptoms of a heart attack. When someone experiences these, it is best to call for an ambulance (telephone: 995) and be taken to the nearest Emergency Department for immediate evaluation.

A-5: WHAT HAPPENS IN A CARDIAC ARREST?

When a portion of the heart muscles dies, it affects the electrical impulses within the heart. The orderly flow of electrical signals within the heart is disrupted. This is a dangerous situation and an irregular, chaotic electrical rhythm called Ventricular Fibrillation (**VF**) develops in many cases (see figure A12).

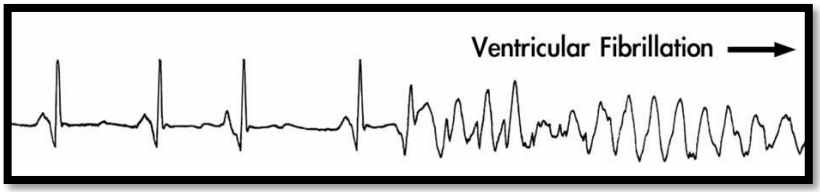


Figure A12 - Normal Sinus Rhythm to Ventricular Fibrillation

When VF occurs, the heart does not pump the blood to the rest of the body. This is a state of **cardiac arrest** and the casualty will be unconscious and stops breathing normally.

At the start of a cardiac arrest, the oxygen level in the blood decreases, causing brain damage. If this situation is reversed immediately, survival chance could be as high as 90%. With a 6 minutes delay, this drops to 40–50% and at 9 minutes, it is a dismal 10% (see figure A13).

Figure A13 - Irreversible brain damage after 10 minutes

To avoid this, immediate CPR and defibrillation are key components for increased chances of survival.

A-6: OTHER COMMON CAUSES OF CARDIAC ARREST

A heart attack is the most common cause of cardiac arrest. There are other causes, which include:

Figure A14 - Other common causes of cardiac arrest

Death in these situations can be prevented if someone trained in CPR and first-aid skills provides prompt help.

A-7: THE CHAIN OF SURVIVAL

The essential steps for helping a cardiac arrest victim are illustrated in a system called the "Chain of Survival". The five rings in this chain are: Early Recognition and Access, Early CPR, Early Defibrillation, Emergency Medical Services (Ambulance) and Advanced Cardiac Life Support (see figure A15).

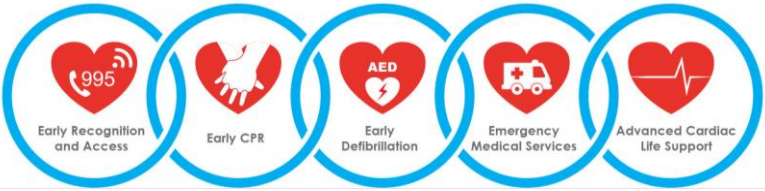


Figure A15 - The chain of survival (picture courtesy of Singapore Heart Foundation)

First Ring: Early Recognition and Access

Call for ambulance (dial 995) and get an AED if visible and near-by. Follow the SCDF dispatcher's instructions.

Second Ring: Early CPR

The brain cells start dying within 4-6 minutes of cardiac arrest. CPR must be initiated as soon as possible to provide oxygen and blood flow to the brain and heart.

Third Ring: Early Defibrillation

Automated external defibrillators (AEDs) are increasingly available in the community, at lift lobbies, void decks, gymnasium, shopping malls, hotels, airports and schools etc. Apply onto the casualty and be ready to defibrillate.

Fourth Ring: Emergency Medical Services (Ambulance)

Quick access to the scene and transport to the hospital makes a difference to the casualty's chances of survival.

Fifth Ring: Advanced Cardiac Life Support

Medical teams will provide advanced cardiac Life Support at the hospital. The first 4 rings will buy time for the casualty to reach advanced care.

SECTION B

Cardio-Pulmonary Resuscitation (CPR)

B-1: THE IMPORTANCE OF EARLY CPR

B-2: ADULT ONE-RESCUER CPR

B-3: STANDARDS FOR PROPER CHEST COMPRESSIONS

B-4: THE RECOVERY POSITION

B-1: THE IMPORTANCE OF EARLY CPR

When the heart stops beating, blood stops flowing through the body. Unless the flow is restarted quickly, other organs in the body will stop functioning. For example, if the blood does not flow to the brain for 4 to 6 minutes, it could result in brain death. CPR is a series of actions required to restart the heart and get the blood flowing once again as soon as possible.

CPR includes mouth-to-mouth ventilation and chest compressions. When mouth-to-mouth ventilation is done during CPR, oxygen is introduced into the body. Chest compression squeezes the heart between the breastbone and the spine and thereby helps to circulate the blood and deliver this oxygen to the vital organs, especially the brain, heart and kidneys.

If CPR is performed promptly and correctly:

- Heart function may be restored, and
- Circulation may be maintained until institution of other life support measures.

In many cases, rescuers in public are unwilling and/or unable to provide ventilations. Hands only (chest compressions only) CPR, which only requires continuous chest compressions without mouth-to-mouth ventilation, is easier to learn and is not less effective than standard CPR.

The next section takes you step-by-step through the procedures needed to perform CPR – the basic skill needed to save lives in the event of cardiac arrest.

B-2: ADULT ONE-RESCUER CPR

MNEMONIC: **DRSABC**

D Check for **D**anger
R Check **R**esponsiveness
S **S**hout for Help and call Ambulance 995
A Get **A**ED
B Check for Normal **B**reathing and Pulse (for trained Healthcare Providers)
C Provide **C**ontinuous **C**hest **C**ompressions

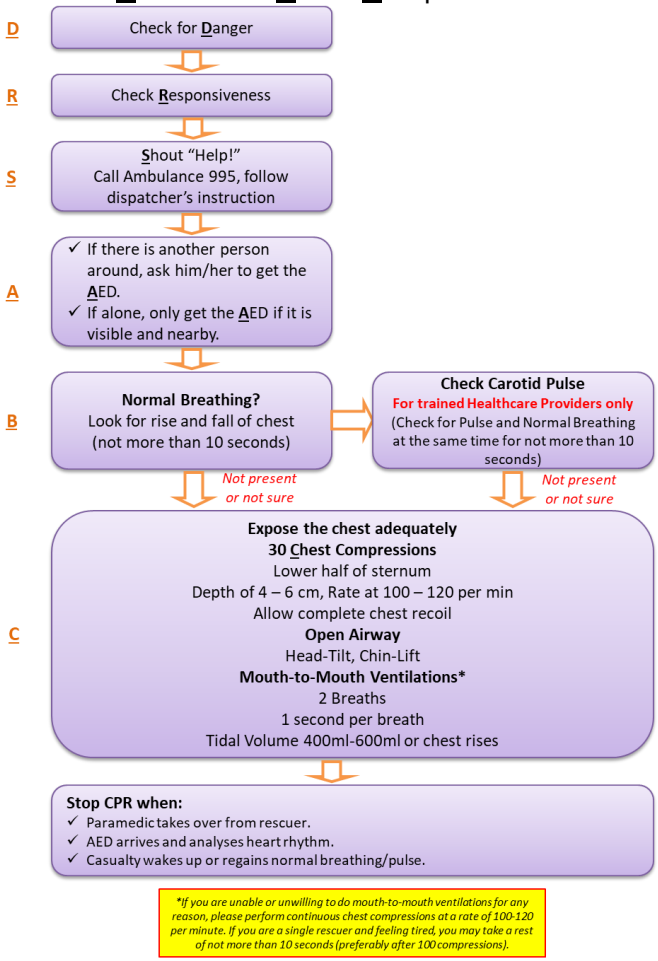


Figure B1 - One rescuer CPR steps

Step 1: Check for danger

- Quickly assess the situation for danger, so that the rescuer can operate in a safe environment.

Step 2: Check for responsiveness

- Quickly assess and determine whether the casualty is responsive. The rescuer should tap or shake the casualty on the shoulders firmly and ask loudly: "Hello! Hello! Are you OK?" (see figure B2)

Figure B2 - Tap shoulder for response

- Avoid violent shaking of the casualty as this may result in injury.
- Avoid unnecessary movements of the neck in the event of injuries to the head and neck.

Step 3: Get help and call for ambulance 995 and a near-by AED

- If the adult is unresponsive, shout loudly for help and immediately call "995" for an emergency ambulance and get AED if visible and nearby. However, if there is another person around, ask him/her to call for an ambulance "995" and get an AED (see figure B3).

Figure B3 - Call Ambulance 995

- When calling for ambulance, the emergency dispatcher will ask the following questions:
  - Location of casualty
  - The telephone number you are calling from
  - What happened (e.g. that someone is having a heart attack or is unconscious)
  - Number of casualties
  - Hang up only after instructed to do so by the dispatcher

Step 4: Position the casualty

Figure B4 - Casualty in prone position

- For CPR to be effective, the casualty must be lying on his/her back on a firm, flat surface. If the casualty is lying face down (prone position – see figure B4), or on his/her side, you will need to roll the casualty over onto his/her back. Do take care that the head, neck and body are supported and turned simultaneously during repositioning, to avoid aggravating any potential cervical spine injury.

Step 5: Check for normal breathing

Figure B5 - Look for normal breathing

- **Look** for the rise and fall of the chest (see figure B5).
- Do not take more than 10 seconds.
- It is important to recognize that gasping is NOT normal breathing but a sign of cardiac arrest (gasping can also happen in severe asthmatic attack). Start chest compressions immediately if unsure whether the casualty has no normal breathing or gasping.

For trained healthcare providers

- Check for carotid pulse when checking for normal breathing. Slide your fingers down into the groove at the side of the neck near you (this is the location of the carotid pulse).
- Checking of normal breathing and pulse should not take more than 10 seconds.
- If unsure about the presence of pulse and no normal breathing, assume cardiac arrest and commence chest compressions.

Step 6: Locate hand position for chest compressions

- Chest compressions consist of a series of rhythmic applications of pressure over the lower half of the sternum (breastbone). These compressions create blood flow to the vital organs (heart, lungs and brain).

- Locate the correct hand position for chest compressions:

    - Expose the chest adequately and start chest compression over the lower half of the sternum (breastbone).
    - Place the heel of your hand on the lower half of the casualty's sternum (breastbone) (see figure B6).

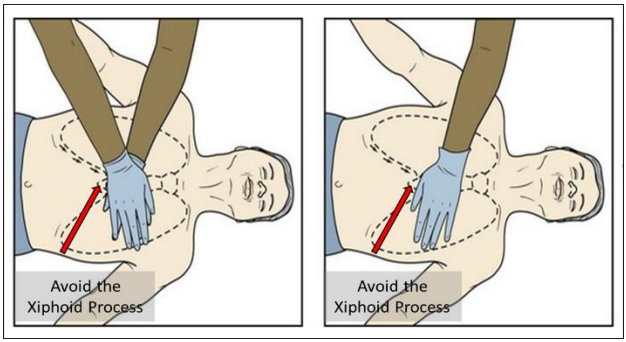


Figure B6 - Chest compression location and avoid the Xiphoid Process

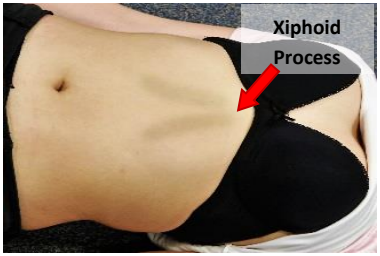


Figure B7 - Xiphoid Process (Female casualty) – to be avoided

Figure B8 - Xiphoid Process (Male casualty) – to be avoided

    * Do not compress on the **Xiphoid Process** (see figures B7 and B8)

Step 7: Perform chest compressions

- Place the heel of the other hand on top of the first hand on the sternum.
- Interlace the fingers of both hands and lift the fingers off the chest wall (see figure B9).

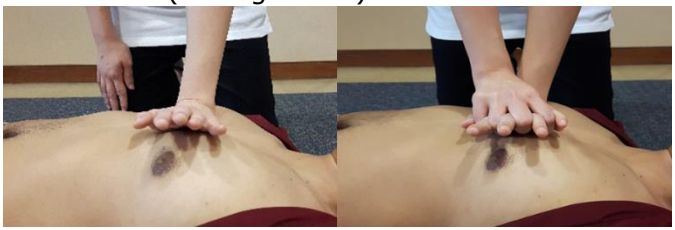


Figure B9 - Lift fingers off the chest wall and interlock hands

- Straighten both elbows and lock them in position.
- Position your shoulders directly over the casualty's chest.
- Use your body weight to compress the casualty's chest vertically to a depth of 4-6 cm, counting as you compress:
  1 and 2 and 3 and 4 and **5** and
  1 and 2 and 3 and 4 and **10** and
  1 and 2 and 3 and 4 and **15**
  1 and 2 and 3 and 4 and **20**
  1 and 2 and 3 and 4 and **25**
  1 and 2 and 3 and 4 and **30**
- Perform 30 chest compressions at a rate of 100-120 per minute.

STEP 8: Mouth-to-mouth ventilations

At the end of the 30 chest compressions, perform mouth-to-mouth ventilations:

- Perform a Head-Tilt, Chin-Lift maneuver. An open airway will ensure mouth-to-mouth ventilations are effective. In the unresponsive casualty, muscle tone is impaired resulting in the tongue falling back and obstructing the airway (see figure B10). As the tongue is attached to the lower jaw, moving the lower jaw forward will lift the

tongue away from the back of the throat and open the airway.

- **Head-tilt** - Place your palm on the forehead and push it backwards.
- **Chin-lift** – Using the thumb and the index finger of your other hand to lift the bony part of the chin upwards (see figure B11).
- Pinch the casualty's nose with your index finger and thumb; and seal your lips around the casualty's mouth (see figure B12).
- Give 2 quick and short breaths, each lasting 1 second.
- Release the nose after each breath.
- Each breath should be enough to make the chest rise. This is approximately 400 – 600 ml of air.
- Do not interrupt chest compressions for more than 10 seconds to perform 2 breaths.

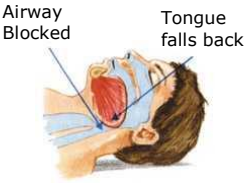


Figure B10 - The airway blocked by the tongue

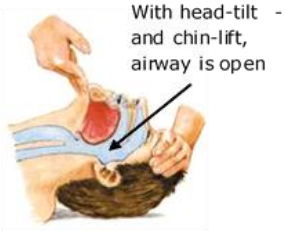


Figure B11 - The Head-Tilt, Chin-Lift Maneuver

Figure B12 - Technique for effective ventilations

Note:

- ♥ Do not press deeply into the soft tissues under the chin.
- ♥ Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension.

The cycles of 30 compressions to 2 ventilations should be continued until one of the following occurs:

- An AED is connected to the casualty and prompts you to stop CPR.

- The ambulance crew arrives and takes over further care of the casualty.
- The casualty regains normal breathing or consciousness.

♥ If you are unable or unwilling to do mouth-to-mouth ventilations for any reason, please perform continuous chest compressions at the rate of 100 – 120 per minute. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 compressions).

Step 10: Re-assessment

- Check for normal breathing after every 5 cycles of CPR 30:2.
- If breathing is absent or you are unsure about presence of breathing, continue CPR 30:2.
- If there is normal breathing, position the casualty in the recovery position.
- Continue to monitor the casualty's breathing every 2 minutes as these can stop suddenly.

For Trained-Healthcare Provider

- Check for normal breathing and pulse after every 5 cycles of CPR 30:2.
- If normal breathing and pulse are absent or you are unsure, continue CPR 30:2.
- If pulse is present and normal breathing is absent, perform rescue breathing at a rate of 12 breaths per minute (one breath every 5 seconds) by giving one breath and counting **2-a-thousand, 3-a-thousand, 4-a-thousand, 5-a-thousand**.
- Repeat the sequence until you have completed a total of 12 breaths. Re-assess for normal breathing and pulse.
- If both the breathing and pulse are present, position the casualty in the recovery position.

- Continue to monitor the casualty's breathing and pulse every 2 minutes as these can stop suddenly.

B-3: STANDARDS FOR PROPER CHEST COMPRESSIONS

- For effective chest compressions, rescuer should "push hard, push fast".
- Compress the casualty's chest vertically to a depth of 4 – 6 cm, counting as you compress (see figure B13).
- Make sure you allow complete chest recoil before starting the next chest compression (see figure B14).
- Do not lift the heels of your hands off the chest between compressions.
- Continue chest compressions at the rate of 100-120 per minute.
- Do not stop CPR until paramedics take over or casualty is conscious, opens his/her eyes, starts talking and has normal breathing as the return of spontaneous breathing in an out-of-hospital context is extremely rare.
- Provision of CPR is highly recommended as any interruption may negatively affect the survival outcome.
- If casualty regains consciousness, starts talking or has normal breathing, stay with the casualty and continue to monitor the casualty until arrival of paramedics.

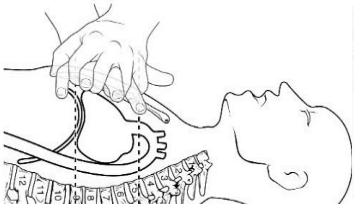


Figure B13 - Compression of the heart

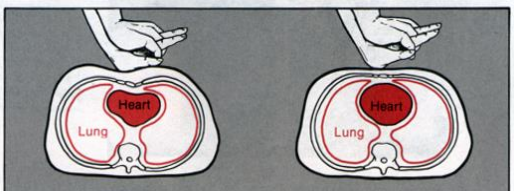


Figure B14 - Compression and release during CPR

B-4: THE RECOVERY POSITION

The recovery position is used in the management of casualties who are unresponsive but breathing and pulse are present. When an unresponsive casualty is lying supine (on the back with the face upwards), the airway may be obstructed by the tongue, mucus or vomitus. These problems may be prevented by placing the casualty on his/her side so that fluid can drain easily from the mouth.

If there is no evidence of trauma, place the casualty on his/her side in the recovery position. The recovery position keeps the airway open. The following steps are recommended:

Step 1: Position the casualty

Figure B15 – Tuck the hand under the casualty's hip

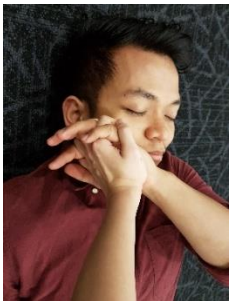


Figure B16 – Place the back of hand against the casualty's cheek

- Tuck the hand nearer to you, arm straight and palm upward under the casualty's hip (see figure B15).
- Bring the other arm (further from you) across the casualty's chest and place the back of his/her hand against his/her cheek (see figure B16).
- Put your palm against the casualty's palm that is on the cheek and maintain this position.

- Using your other hand, bend the casualty's far knee to a 90-degree angle, hold the casualty's far hip and roll him/her towards you (see figure B17).

Figure B17 – Bend the casualty's far knee to a 90-degree angle

Step 2: Roll the casualty towards the rescuer

- Use your knees/thighs to support the casualty's body as you turn him/her towards you to prevent him/her from rolling too far forward (see figure B18).

Figure B18 – Turn casualty towards you

Step 3: Final recovery position

- Ensure that the casualty's cheek is resting on the back of his/her palm.
- Check that the casualty's other hand is positioned alongside his/her body with palm facing upwards.
- The former far leg should preferably be bent at the knee to a 90-degree angle (see figure B19).
- Stay with the casualty and monitor his/her breathing continuously.

Figure B19 – The recovery position

SECTION C

AUTOMATED EXTERNAL DEFIBRILLATION (AED)

C-1: The Importance of Early Defibrillation

At the time of a sudden cardiac arrest, the most common underlying cardiac rhythm is an irregular and chaotic electrical rhythm called **Ventricular Fibrillation** or **VF (shockable rhythm)** (see figure C1). However, not all cardiac arrests present itself as VF and may appear as other electrical rhythms (eg. asystole which is non-shockable).

Figure C1 - Ventricular Fibrillation

During VF, the heart muscles do not contract effectively and delivery of blood to the rest of the body ceases. The treatment for VF is a shock administered using an AED. This shock, together with chest compressions, will reinstate normal heart rhythm and contractility if administered as soon as possible (within 4 minutes). The survival rate decreases by 7-10% for every minute of delay in treating VF. If delayed or untreated, VF eventually degenerates into a fatal rhythm known as **asystole** where the heart has no electrical activity as reflected by a flat line tracing (see figure C2). At this juncture, the only treatment possible is to administer CPR.

In the past, only trained doctors, nurses and paramedics, could perform manual defibrillation as it requires the operator to recognize the cardiac rhythm of the casualty, whether it is **shockable** or **non-shockable**. Since the invention of the AEDs, which are able to analyse the casualty's cardiac rhythm through the electrode pads and advise if a shock is needed, a lay rescuer can now perform the defibrillation, improving survival rates.

Figure C2 - Asystole

The AED should be brought to every person in cardiac arrest. Therefore, when calling for the emergency ambulance (995), also call for an AED by instructing others nearby **"Get AED"**. The rescuer may personally get the AED if it is visible and nearby.

Research has shown that cardiac arrest casualties with VF who are treated promptly have the best chances of survival. Similar experiences from around the world has also demonstrated that more lives are saved if early CPR is combined with early defibrillation (see figure C3).

Chain of survival factors in cardiac arrest and their impact on outcomes

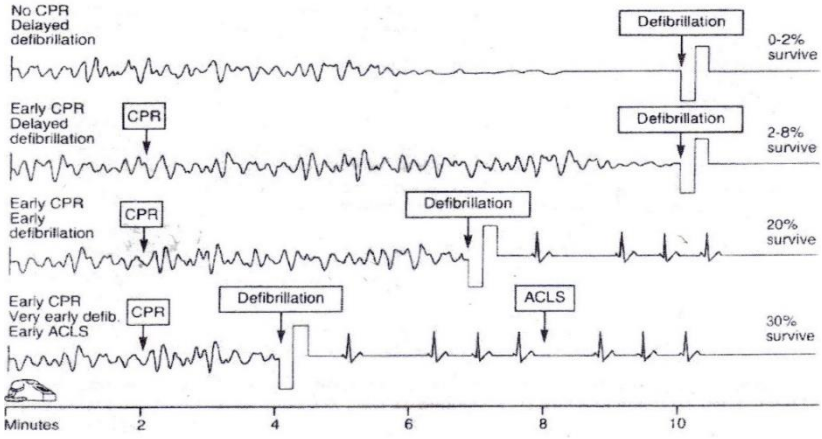


Figure C3 - Importance of the chain of survival

C-2: AUTOMATED EXTERNAL DEFIBRILLATORS (AEDs)

Automated External Defibrillators (AED) are devices that deliver electrical shocks to treat VFs, allowing the heart to restore its function. AEDs are defibrillators designed to be small in size, lightweight and portable (see figure C4). They generally work on similar basic principles and do the following:

- Analyze the electrical rhythm of the heart.
- Determine whether the heart needs to be shocked.
- If a shock is required, it automatically charges to a pre-set energy level. If no shock is required, the device will not charge-up.
- Deliver electric shocks via attached AED pads.
- Advise the rescuer through voice prompts on key actions to deliver the shock, check the casualty or continue CPR.
- Some AEDs provide counting tempo to assist rescuers in chest compressions.

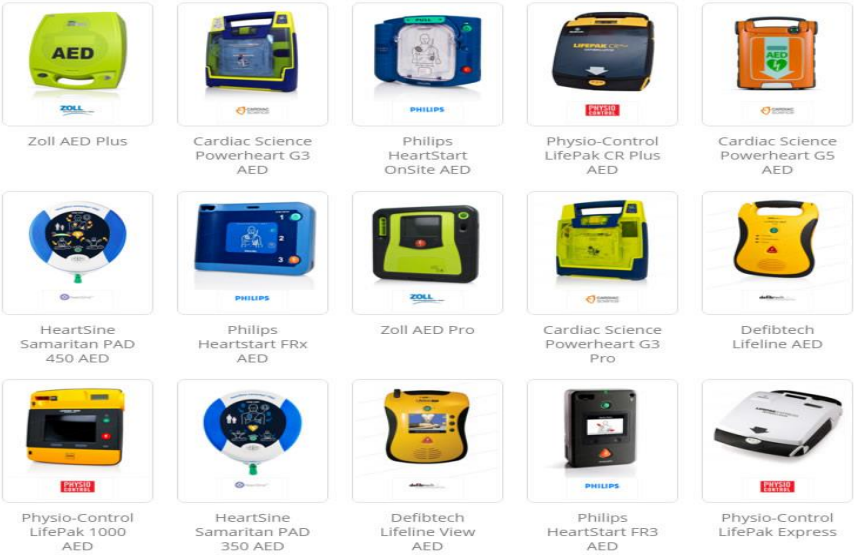


Figure C4 - various models of AEDs

C-3: PREPARATIONS FOR AED USE

The rescuer must first ascertain that the scene is safe for use of an AED. Avoid the following:

- **Metal surface -** remove casualty from contact with metal surfaces. These can conduct electric currents to the rescuer.

- **Water** - Sweat and moisture are good conductors of electricity and pose danger to the rescuer. It also reduces the adhesion of pads to the chest wall. If the chest is wet, wipe dry quickly with a towel.

- **Gas** - Flammable gases and oxygen sources are fire hazards. Move the casualty away from these before applying AED.

Steps in chest preparation and applying the AED electrode pads (see figure C5):

- Expose the chest of the casualty to facilitate application of AED electrode pads. If needed, cut away the clothing.

- If chest hair prevents proper pad placement, shave the hair from these sites promptly. AEDs come with a shaver blade to expedite this.

- Metallic objects such as necklace and chains should be moved away from the pads. These may result in sparks and potential burns to the chest wall.

- For casualties with a pacemaker or implanted cardiac defibrillator on the right, apply the pads at least four fingers breadth away from these devices.

- Medication patches or monitoring electrodes on the chest wall should be removed as they may interfere with pads placement.

- Wipe dry a wet or sweaty chest to ensure proper adhesion of the electrode pads to the chest.

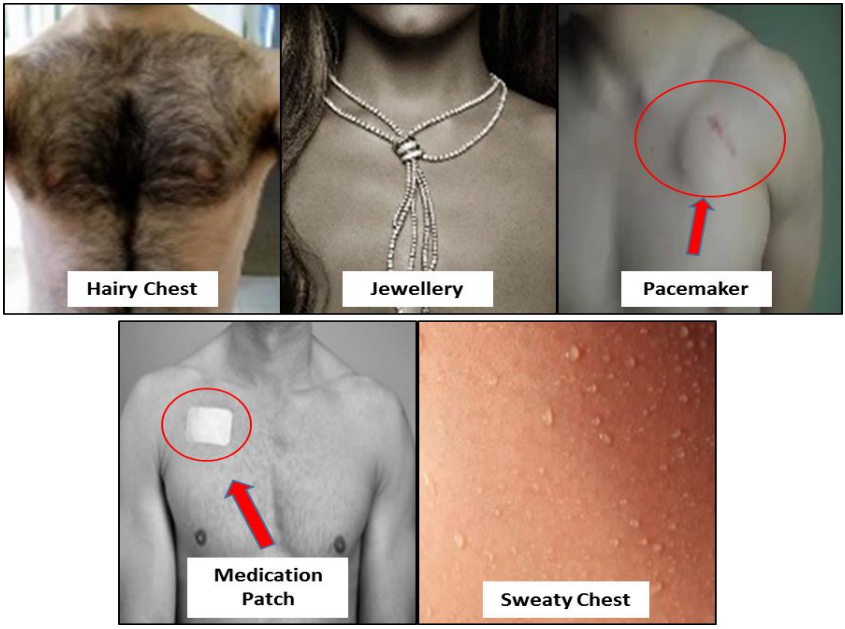


Figure C5 - Things to take note of during chest preparation

Application of AED electrode pads to the chest wall must be done quickly with minimal interruptions to chest compressions.

C-4: PLACEMENT OF AED ELECTRODE PADS

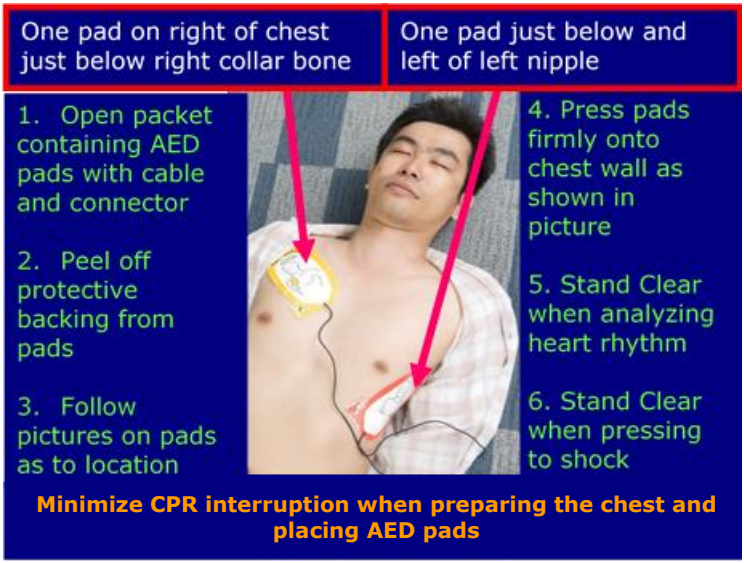


Figure C6 - AED electrode pads placement and operations

1. Switch on the AED. Some AEDs would automatically turn ON when the AED cover is lifted.
2. Open the package that contains the AED pads with attached cable and connector.
3. Peel off protective backing from the pads.
4. Apply the AED pads on the chest according to the instructions on the AED (see figure C6).

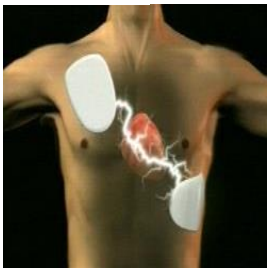


Figure C7 - How AED shocks the heart

5. The right pad is placed on the casualty's right chest just below the collar bone. The left pad is placed on the left chest just below and to the left of the left nipple (see figure C7).
6. Plug the connector end of the cable into the AED. Some AEDs already have pre-connected electrode pads cable and may start analysis once the pads are in place.

C-5: DEFIBRILLATION PROCEDURES

1. The AED will initially analyze the heart's electrical rhythm. It will give a voice prompt, such as

   "ANALYZING HEART RHYTHM. DO NOT TOUCH THE CASUALTY."

   If you hear this, stop chest compressions. Do not touch the casualty and do not allow others to touch the casualty while the AED is analyzing.

2. Spread your arms apart and say clearly "Stay Clear" (see figure C8).

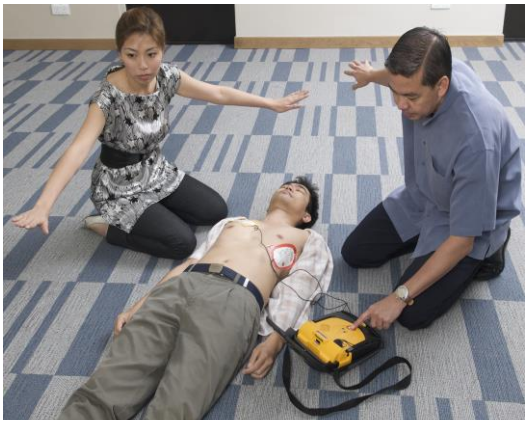


Figure C8 - "Stay clear!"

3. If the casualty has a shockable rhythm (i.e. VF), it will charge automatically. Charging takes a few seconds and may be indicated by a warning tone from AED. No one should touch the casualty during this brief charging phase.

4. Once the AED is fully charged, it will prompt "PRESS THE SHOCK BUTTON NOW". The rescuer then states clearly "Stand Clear", ensures quickly that no one is touching the casualty, and then presses the shock button on the AED firmly before releasing it.

5. Once the shock is delivered, restart chest compressions. Continue the chest compressions until the AED repeats the voice prompt: "ANALYZING HEART RHYTHM. DO NOT TOUCH THE CASUALTY."

6. If the AED prompts: "NO SHOCK ADVISED", restart chest compressions immediately.

7. Only stop CPR when the casualty starts breathing normally or moving and regains consciousness. Place him/her in a recovery position to prevent the tongue from obstructing the airway and facilitate drainage of mouth secretion. Continue to monitor the casualty until help arrives.

8. Throughout this period, the AED should remain connected to the casualty.

SUMMARY OF AED APPLICATION SEQUENCE

Apply AED pads while CPR is in progress

Continue CPR
Open AED box
Turn on AED
Prepare chest
Apply pads – right and left chest
Plug in connector
Analyze rhythm

C-6: CPR+AED PROTOCOL SUMMARY

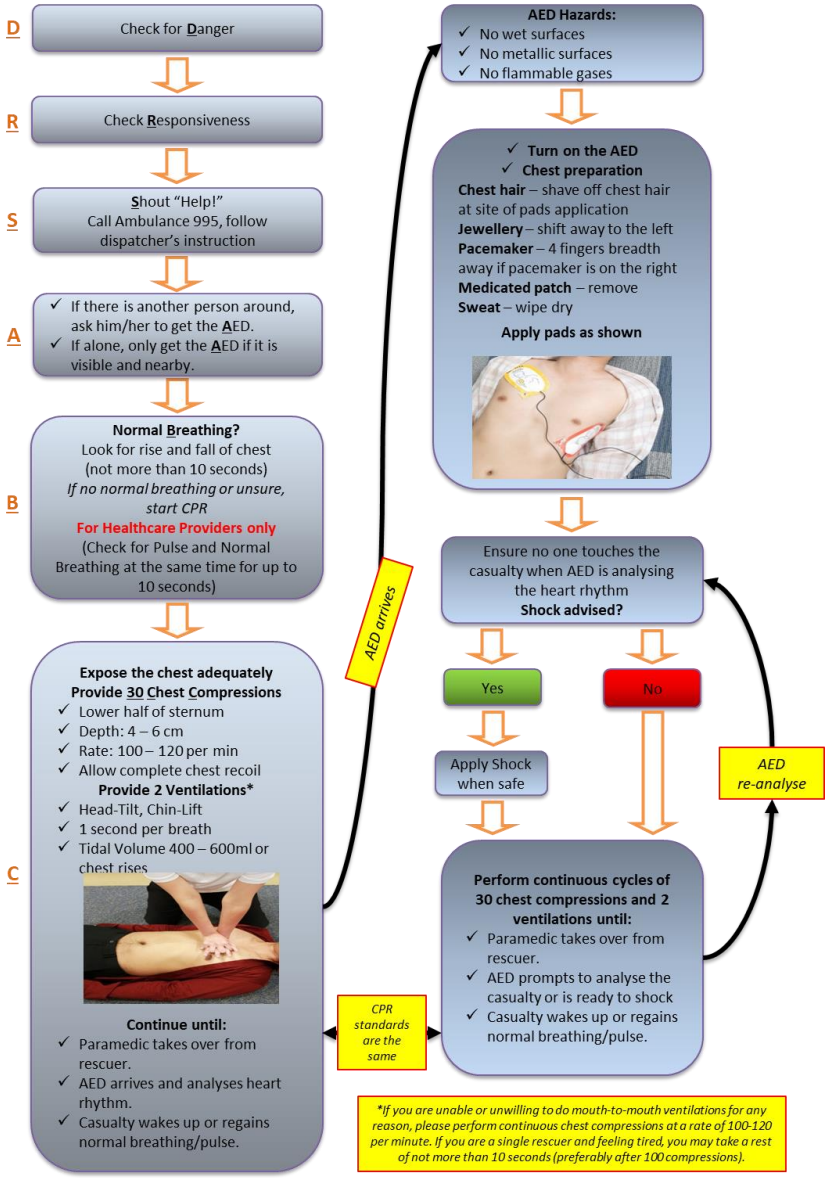


Figure C9 – Summary of CPR+AED

C-7: POST-INCIDENT PROCEDURES

Hand-over to emergency services

When paramedics takes over the casualty, they may require a summary of the events that has occurred:

- Time of collapse (best estimate)
- Whether the AED was used
- How many shocks were given?
- Any previous medical history and medications, if known.
- If available, provide a document that lists these events.

Assist the paramedics:

- Until casualty is loaded into the ambulance
- The defibrillation cable with pads should remain on the casualty en-route to hospital.

Housekeeping the AED for future use

Inform the facility or safety manager, in case of commercial establishments or work places, or the local community center or management office for residential areas that the AED has been used.

The person in charge of the AED has the following responsibilities:

- Replace the AED consumables such as the electrode pads, shaver kit, towel and gloves if used.
- The AED battery must be checked. Contact the vendor of the AED device for advice on battery replacement.
- If the AED was removed from a box with a key in a thin glass window, the glass may have been broken to retrieve the key. This glass piece would need to be replaced and the key placed back onto the holder.
- Most AEDs have a chip that records the resuscitation sequence. Get the AED vendor to print the record from this chip. It is useful for audit and quality assurance purposes.

Maintenance of AED

AEDs are almost maintenance-free. Replacement of consumed items in the AED has been described above.

The battery indicator on the AED needs to be checked daily to ensure that it is still functional. Once it gives a low-battery display, steps to replace the battery promptly should be undertaken.

C-8: CHILD/INFANT DEFIBRILLATION

Use of AED for Child/Infant

- AEDs can be used safely for children aged one year or older.
- AEDs are capable of accurately identifying arrhythmias in children; they are very unlikely to advise a shock inappropriately.
- Those aged between 1–8 years should preferably be defibrillated with paediatric pads if available.
- If an AED with paediatric pads is not available, an AED with adult pads may be used.
- For casualties less than one year old, the incidence of shockable rhythms is very low unless if they are suffering from cardiac disease.
- In these cases, the risk/benefit ratio may be favourable, and the use of an AED (preferably with paediatric pads) should be considered.

Placement of Defibrillation Pads for Children/Infant

1. Anterior-anterior defibrillation pads placement is advised. **Ensure that the pads are not touching** and are at least 1-2cm apart (see figure C10).

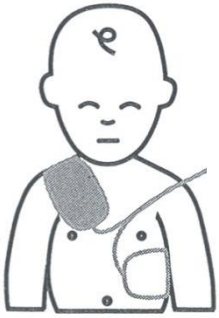
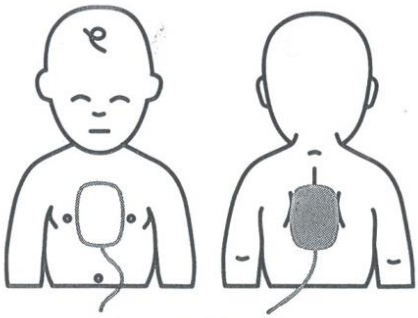


Figure C10 - Anterior-anterior AED electrode pads placement

Anterior-Anterior
Electrode Placement

OR

2. **If the pads are touching**, apply front (right pad on central sternum) and back (left pad on the upper back between the shoulder blades). Attach the child defibrillation pads on front and back (anterior-posterior) as shown (see figure C11):



Anterior-Posterior
Electrode Placement

Figure C11 - Anterior-posterior AED electrode

C-9: SAMPLE PRACTICAL SCENARIOS

The following scenarios may be used by the instructor to depict possible situations which you may encounter due to the varied nature of an emergency. By practicing these scenarios, you can be more confident to assist a casualty in emergencies.

1) Shock – No Shock – No Shock
2) No Shock – Shock – No Shock
3) Shock – Shock – No Shock
4) No Shock – No Shock – Shock
5) No Shock – No Shock – No Shock

SECTION D

ADULT FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

D-1: Introduction

Complete airway obstruction is an emergency that will result in death within minutes, if not treated immediately. A casualty can develop airway obstruction from either intrinsic (tongue and epiglottis) or extrinsic (foreign body) causes.

Intrinsic Causes

- The tongue can fall backward into the pharynx in an unconscious casualty in the supine position.
- Blood from head and facial injuries can flow into the airway.
- Regurgitated stomach contents can enter the airway.

Extrinsic Causes

Foreign bodies, e.g. food, dentures etc.

Contributing Factors

1. Large, poorly chewed pieces of meat/food.
2. Elevated blood alcohol levels.
3. Dentures.
4. Playing, crying, laughing and talking with food in the mouth.

Precautions

1. Cut food into small pieces. Chew slowly and thoroughly, especially if wearing dentures.
2. Avoid excessive intake of alcohol.
3. Avoid laughing and talking when the mouth is full.

D-2: RECOGNITION OF FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

Figure D1 – The universal sign of choking

Foreign Body Airway Obstruction (FBAO) can be either partial or complete. Coughing is the body's natural defence against airway obstruction.

A casualty with **partial** (mild) airway obstruction will cough to expel the foreign body. If the casualty is wheezing (breathing noisily with a wheezing sound) or coughing, this means that the airway is partially obstructed. Do not interfere. Allow the casualty to cough to expel the object himself/herself.

In **complete** (severe) airway obstruction, the casualty is unable to speak, breathe or cough and may become cyanotic (blue). The casualty will clutch the neck with thumb and fingers, the universal distress signal for choking (see figure D1) that requires immediate action (see figure D2).

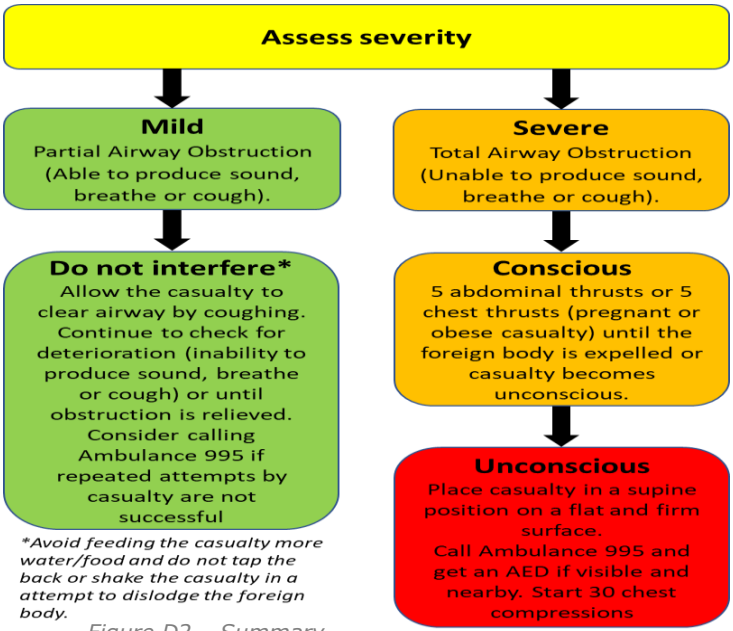


Figure D2 – Summary of adult FBAO relief

D-3: RELIEF OF FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

Techniques used to relieve FBAO include the Heimlich Manoeuvre (abdominal thrusts) and chest thrusts for pregnant and obese casualties.

The **Heimlich Maneuver**, also known as the sub-diaphragmatic abdominal thrusts or abdominal thrusts is recommended for the relief of FBAO in responsive adults (more than 8 years of age) and children (1 to 8 years of age). The Heimlich Maneuver elevates the diaphragm and increase airway pressure, which forces air out from the lungs. This creates an artificial cough which can expel the foreign body from the airway.

In obese or pregnant casualties, **chest thrusts** should be used instead of abdominal thrusts.

Complications from Heimlich Maneuver

If perform incorrectly, it may cause injuries to the internal organs resulting in rupture or laceration of abdominal or thoracic viscera.

D-4: HEIMLICH MANEUVER

Step 1: Assessment

- Ask: "Are you choking?" (see figure D3) If the casualty is choking, the casualty will not be able to speak, breathe or cough but may nod his/her head. Tell the casualty that you can help.

Figure D3 – Ask "Are you choking?"

Note:

♥ If the casualty is able to cough, instruct the casualty to cough as hard as possible. If casualty is unable to cough, perform the Heimlich Manoeuvre.

Step 2: Position of rescuer

- If the casualty is standing, the rescuer stands behind the casualty.
- If the casualty is sitting, the rescuer kneels down and positions himself/herself behind the casualty.

Step 3: Locate the landmark

- Put your arms around the casualty's abdomen.
- Locate the navel.
- Place 2 fingers above the navel (see figure D4) and well below the tip of xiphoid process.
- Make a fist with the other hand with the thumb in the palm (see figure D5).

Figure D4 – Place 2 fingers above the navel

- Place the thumb side of the fist against the casualty's abdomen in the midline and just above the 2 fingers' spacing.

Step 4: Heimlich Maneuver

- Lean the casualty forward with one hand, while maintaining the fist against the abdomen (see figure D6).
- Grasp your fist with your other hand.

Figure D5 – Making a fist with thumb in the palm

Figure D6 – Lean the casualty forward

- Give quick inward and upward abdominal thrusts in one motion into the casualty's abdomen (see figure D7).
- Deliver each abdominal thrust firmly and distinctly with the intent of relieving the obstruction until the foreign body is expelled or the casualty becomes unconscious.

Figure D7 – give quick inward and upward abdominal thrusts

Note:

♥ Usually, this procedure will force the foreign object out of the throat and the airway obstruction will be relieved.

The Self-Administered Heimlich Maneuver

- To treat one's own complete FBAO, the casualty makes a fist with one hand, places the thumb-side on the abdomen above the navel (2 fingers' breadth) and below the xiphoid process, grasps the fist with the other, and then presses inward and upward toward the diaphragm with a quick motion.

- If unsuccessful, the casualty can also press the upper abdomen over any firm surface such as the back of a chair, side of a table or porch railing. Several abdominal thrusts may be needed to clear the airway.

D-5: CHEST THRUSTS

This technique is used as an alternative for obese or pregnant casualties.

Step 1: Assessment

- Ask: "Are you choking?" (see figure D8) If the casualty is choking, the casualty will not be able to speak, breathe or cough but may nod his/her head. Tell the casualty that you can help.

Figure D8 – Ask "Are you choking?"

Step 2: Position of rescuer

- If the casualty is standing, the rescuer stands behind the casualty.
- If the casualty is sitting, the rescuer kneels down and positions himself/herself behind the casualty.

Step 3: Location of landmark

- Place your arms under the casualty's armpits encircling the chest (see figure D9).
- Make a fist with one hand with the thumb in the palm (see D10).
- Place thumb-side of fist on the middle of the casualty's sternum (breastbone) (see figure 11).

Figure D9 – Place arms under the casualty's armpits encircling the chest

Figure D10 – Making a fist with thumb in the palm

Figure D11 – Place thumb-side of fist on the middle of the casualty's sternum

Step 4: Chest thrusts

- Grasp your fist with your other hand and bring yourself close to the casualty before giving quick backward thrusts (see figure D12).

- Deliver each backward thrust firmly and distinctly with the intent of relieving the obstruction until the foreign body is expelled or the casualty becomes unconscious.

Figure D12 – Give quick backward thrusts

D-6: RELIEF OF UNCONSCIOUS ADULT FBAO

If the casualty becomes unconscious, proceed with the following steps.

Step 1: Position the casualty

Support and position the casualty lying on his/her back on a firm flat surface (see figure D13).

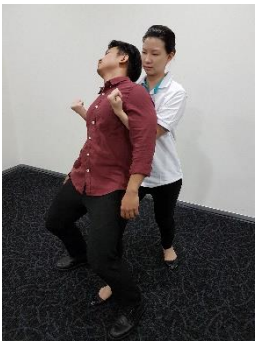


Figure D13 – Support the casualty

Step 2: Activate the Emergency Medical Service (EMS)

Rescuer shouts:
Rescuer shouts: "Help! Call ambulance 995 and get an AED!" (see figure D14).

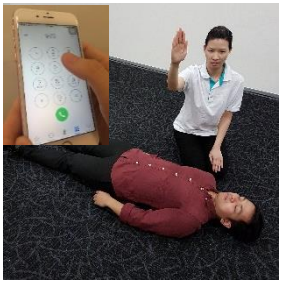


Figure D14 – Get help!

Step 3: Start 30 chest compressions

- Locate the landmark and perform 30 chest compressions using the same location and techniques used for chest compressions in CPR.

Step 4: Open the airway

- Perform the Head-Tilt, Chin-lift maneuver to open the airway.
- While maintaining head tilt, open the mouth gently to check for visible foreign bodies.
- If a foreign body is seen, maintain the open airway with the Head-Tilt, Chin-Lift maneuver (see figure D15) and

insert the index finger of your other hand into the casualty's mouth (see figure D16) along the inside of the cheek.

- Use a hooking action to dislodge the foreign body and maneuver it out of the mouth. Take care not to force the foreign body deeper into the throat. This maneuver is known as the **finger sweep** (see figure D17).

Figure D15 – Head-tilt and chin-lift maneuver

Figure D16 – insert the index finger of your other hand into the casualty's mouth

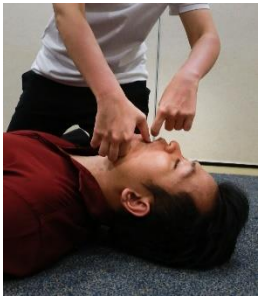


Figure D17 – Finger sweep

Note:

♥ Do not perform blind finger sweep. Blind finger sweep may push the object back or further into the airway.

Step 5: Mouth-to-mouth ventilations

Figure D18 – Mouth-to-mouth ventilation

- Attempt one ventilation by performing mouth-to-mouth breathing (1st ventilation) (see figure D18).
- If there is no resistance, airway is clear. Check for normal breathing and pulse, and if absent, start CPR.
- If there is resistance (i.e. the chest does not rise), the airway may be blocked. Reposition the casualty's head with the Head-Tilt, Chin-Lift maneuver and re-attempt to ventilate (2nd ventilation).

Note:

- ♥ Do not press deeply into the soft tissues under the chin.
- ♥ Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension.

Step 6: Chest compressions

- If there is resistance (i.e. the chest does not rise), perform 30 chest compressions using the same location and techniques as in CPR (refer to "One-Rescuer CPR"; Steps 6 and 7; Page 17 and 18) (see figure D19).

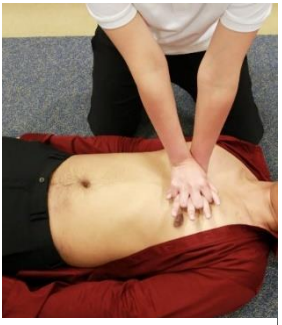


Figure D19 – Perform chest compressions using the same location and techniques as CPR

- Perform the Head-Tilt, Chin-Lift maneuver and check for the presence of any foreign body.
- Repeat Steps 4 to 6 until help arrives and takes over or the casualty starts breathing, coughing, talking or moving.

For Trained-Healthcare Provider

- Check for normal breathing and pulse.
- If normal breathing or pulse are absent or you are unsure, start CPR 30:2.
- If pulse is present and normal breathing is absent, perform rescue breathing at a rate of 12 breaths per minute (one breath every 5 seconds) by giving one breath and counting **2-a-thousand, 3-a-thousand, 4-a-thousand, 5-a-thousand**.
- Repeat the sequence until you have completed a total of 12 breaths. Re-assess for normal breathing and pulse.
- If both the breathing and pulse are present, position the casualty in the recovery position.
- Continue to monitor the casualty's breathing and pulse every 2 minutes as these can stop suddenly.

Summary of Unconscious Adult FBAO Relief

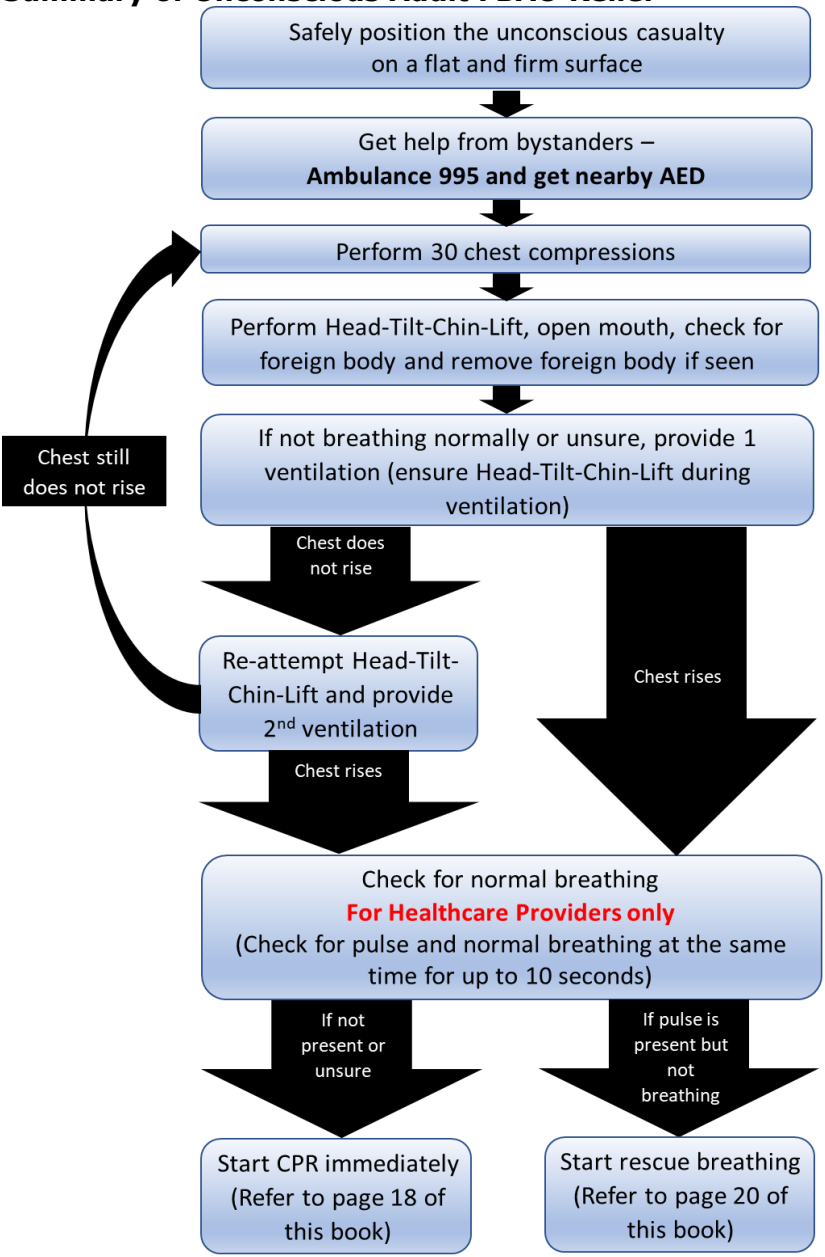


Figure D20 – Summary of unconscious adult FBAO relief

SECTION E

CHILD CARDIO-PULMONARY RESUSCITATION (CPR)

E-1: CHILD CPR

E-2: THE RECOVERY POSITION (CHILD)

E-1: CHILD CPR

This module addresses children from 1 to 8 years of age.

Children in this age group rarely collapse owing to a primary heart problem. Cardiac arrest is usually secondary to other events, such as major trauma or respiratory illness. Therefore, rescuers must detect and promptly treat early signs of respiratory and circulatory failure to prevent cardiac arrest.

Note:

♥ If a child is below 8 years old but of a larger size or a child that is above 8, perform chest compressions as in Adult CPR.

Step 1: Check for danger

- Quickly assess the situation for danger, so that the rescuer operates in a safe environment.

Step 2: Check for responsiveness

- Quickly assess and determine whether the child is responsive. The rescuer should tap or shake the child on the shoulders firmly and ask loudly: "Hello! Hello! Are you OK?"

Figure E1 – Check for responsiveness

- Avoid violent shaking of the child as this might result in injury.
- Avoid unnecessary movements of the neck to prevent injuries to the head and neck.
- If the child does not respond, he/she is likely to be unconscious. This may be due to:
    - An airway that is obstructed (blocked) by the tongue that has fallen backwards, food or secretions.
    - Breathing that has stopped.
    - The heart that has stopped beating, usually because of heart disease.

- If the child is unconscious, you will have to act quickly.

Step 3: Activate emergency medical service (EMS)

- If the child does not respond, shout loudly for help (see figure E2) and immediately call "995" (see figure E3) for an emergency ambulance and get AED if visible and nearby. However, if there is another person around, ask him/her to call for an ambulance "995" and get an AED

Figure E2 – Get help

- When calling the EMS, state:
    - Location of the child.
    - The telephone number you are calling from.
    - What happened (e.g. that a child is unconscious).
    - Number of casualties.
    - Hang up only after instructed to do so by the dispatcher.

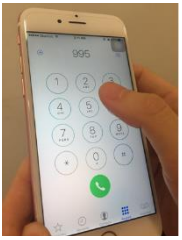


Figure E3 – Call 995

Step 4: Position the child

- For CPR to be effective, the child must be lying on his/her back and on a firm, flat surface. If the child is lying face down or on his/her side, you will need to roll the child over onto his/her back. Do take care that the head, neck and body are supported and turned simultaneously during repositioning, to avoid aggravating any potential cervical spine injury.

Step 5: Check for normal breathing

- **Look** for the rise and fall of the chest (see figure E4).
- Do not take more than 10 seconds.
- It is important to recognize that gasping is NOT normal breathing but

Figure E4 – Look for normal breathing

a sign of cardiac arrest (gasping can also happen in severe asthmatic attack). Start chest compressions immediately if unsure whether the casualty has no normal breathing or gasping.

For trained healthcare providers

- Slide your fingers down into the groove at the side of the neck near you (this is the location of the carotid pulse) (see figure E5).
- Apply gentle pressure and feel for the carotid pulse at the same time as checking for normal breathing.

Figure E5 – Checking carotid pulse

- Checking of normal breathing and pulse should not take more than 10 seconds.
- If the child has no normal breathing and pulse, commence chest compressions.
- If unsure about the presence of pulse and no normal breathing, assume cardiac arrest and commence chest compressions.

Step 6: Locate hand position for chest compressions

- Chest compressions consist of a series of rhythmic applications of pressure over the lower half of the sternum (breastbone). These compressions create blood flow to the vital organs (heart, lungs and brain).

Figure E6 – Start chest compressions

- Locate the correct hand position for chest compressions (see figure E6):
    - Ensure adequate exposure to the chest and start chest compression over lower half of the sternum (breastbone).

- Place the heel of one hand on the lower half of the sternum (breastbone).

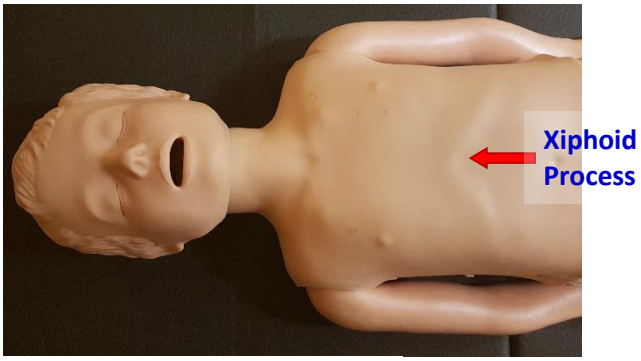


Figure E7 – The Xiphoid Process

  - Do not compress on the Xiphoid Process (see figure E7)

Step 7: Perform chest compressions

- Place the heel of the other hand on top of the first hand on the sternum.
- Interlace the fingers of both hands and lift the fingers off the chest wall (see figure E8).
- Straighten both elbows and lock them in position.
- Position your shoulder directly over the child's chest.
- Use your body weight to compress the child's chest by 4 – 5 cm (1/3 the anterior-posterior diameter) in depth, counting loudly as you compress:

  1 and 2 and 3 and 4 and **5** and

  1 and 2 and 3 and 4 and **10** and

  1 and 2 and 3 and 4 and **15**

  1 and 2 and 3 and 4 and **20**

  1 and 2 and 3 and 4 and **25**

  1 and 2 and 3 and 4 and **30**

Figure E8 – Interlace the fingers of both hands

- Perform chest compressions at a rate of 100-120 per minute.
- The ratio of chest compressions to ventilations is 30:2.
- Perform 5 cycles of 30 chest compressions and 2 ventilations within 2 minutes.

Tips for Proper Chest Compressions

- For effective chest compressions, rescuer should "push hard and push fast".
- Compress the child's chest vertically to a depth of 4 – 5 cm (1/3 the anterior-posterior diameter), counting loudly as you compress.
- Make sure you allow complete chest recoil before starting the next compression.
- Do not lift the heels of your hands off the chest between compressions.

Note:

♥ If you are unable or unwilling to do mouth-to-mouth ventilations for any reason, please perform continuous chest compressions at the rate of 100 – 120 per minute. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 compressions).

Step 8: Mouth-to-mouth breathing

After 30 chest compressions, open the airway and perform mouth-to-mouth breathing:

- Perform a Head-Tilt, Chin-Lift maneuver. An open airway will ensure mouth-to-mouth ventilations are effective. In the unresponsive casualty, muscle tone is impaired resulting in the tongue falling back and obstructing the airway. As the tongue is attached to the lower jaw, moving the lower jaw forward will lift the tongue away from the back of the throat and open the airway.
- **Head-tilt** - Place your palm on the forehead and push it backwards.

- **Chin-lift** – Using the thumb and the index finger of your other hand to lift the bony part of the chin upwards.
- Pinch the casualty's nose with your index finger and thumb; and seal your lips around the casualty's mouth.
- Give 2 quick and short breaths, each lasting 1 second.
- Release the nose after each breath.
- Each breath should be enough to make the chest rise.
- Do not interrupt chest compressions for more than 10 seconds to perform 2 breaths.

Note:

- ♥ Do not press deeply into the soft tissues under the chin and do not hyper-extend the neck because this might obstruct the airway.
- ♥ Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension.

Step 10: Re-assessment

- Check for normal breathing after every 5 cycles of CPR 30:2.
- If breathing is absent or you are unsure about presence of breathing, continue CPR 30:2.
- If there is normal breathing, position the child in the recovery position.
- Continue to monitor the child's breathing every 2 minutes as it can stop suddenly.

For trained healthcare providers

- Check for normal breathing and pulse after every 5 cycles of CPR 30:2.
- If normal breathing and pulse are absent or you are unsure, continue CPR 30:2.

- If pulse is present and normal breathing is absent, perform rescue breathing at a rate of 20 breaths per minute (one breath every 3 seconds) by giving one breath and counting **2-a-thousand, 3-a-thousand**.
- Repeat the sequence until you have completed a total of 20 breaths. Re-assess for normal breathing and pulse.
- If both the breathing and pulse are present, position the casualty in the recovery position.
- Continue to monitor the casualty's breathing and pulse every 2 minutes as these can stop suddenly.

E-2: THE RECOVERY POSITION (CHILD)

The recovery position is used in the management of children who are unresponsive but are breathing with presence of pulse. When an unresponsive child is lying supine (on the back with face upwards), the airway may be obstructed by the tongue, mucus or vomitus. These may be prevented by placing the child on his/her side so that fluid can drain easily from the mouth.

If there is no evidence of trauma, place the child on his/her side in the recovery position. The recovery position keeps the airway open. The following steps are recommended:

Step 1: Position the child

- Tuck the hand nearer to you, arm straight and palm upward, under the child's thigh.
- Bring the arm further from you across the child's chest and place the back of his/her hand against his/her cheek (see figure E9).

Figure E9 – Place the casualty's palm against the cheek

- Put your palm against the child's palm that is on the cheek and maintain this position.
- Using your other hand, bend the child's far knee to a 90-degree angle, hold the child's far hip and roll him/her towards you.

Step 2: Roll the child towards the rescuer

- Use your knees and thighs to support the child's body as you turn him/her to prevent him/her from rolling too far forward (see figure E10).

Figure E10 – Roll the casualty

Step 3: Final recovery position

- Ensure that the child's cheek is resting on the back of his/her palm.
- Check that the child's other hand is position alongside his/her body with palm facing upwards.
- The former far leg should preferably be bent at the knee to a 90-degree angle.
- Stay with the child and check his/her breathing continuously.

SECTION F

CHILD
FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

F-1: INTRODUCTION

F-2: RECOGNITION OF FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

F-3: RELIEF OF CONSCIOUS CHILD FOREIGN BODY AIRWAY OBSTRUCTION (FBAO) USING HEIMLICH MANOEUVRE

F-4: RELIEF OF UNCONSCIOUS CHILD FBAO

F-1 - INTRODUCTION

Complete airway obstruction is an emergency that will result in death within minutes, if not treated immediately. The most common incidence of choking in children is during eating or playing.

Precautions

- Cut food into small pieces and instruct the child to chew slowly and thoroughly before swallowing.
- Discourage the child from talking or laughing when there is food in the mouth.
- Discourage the child from running or playing while eating.

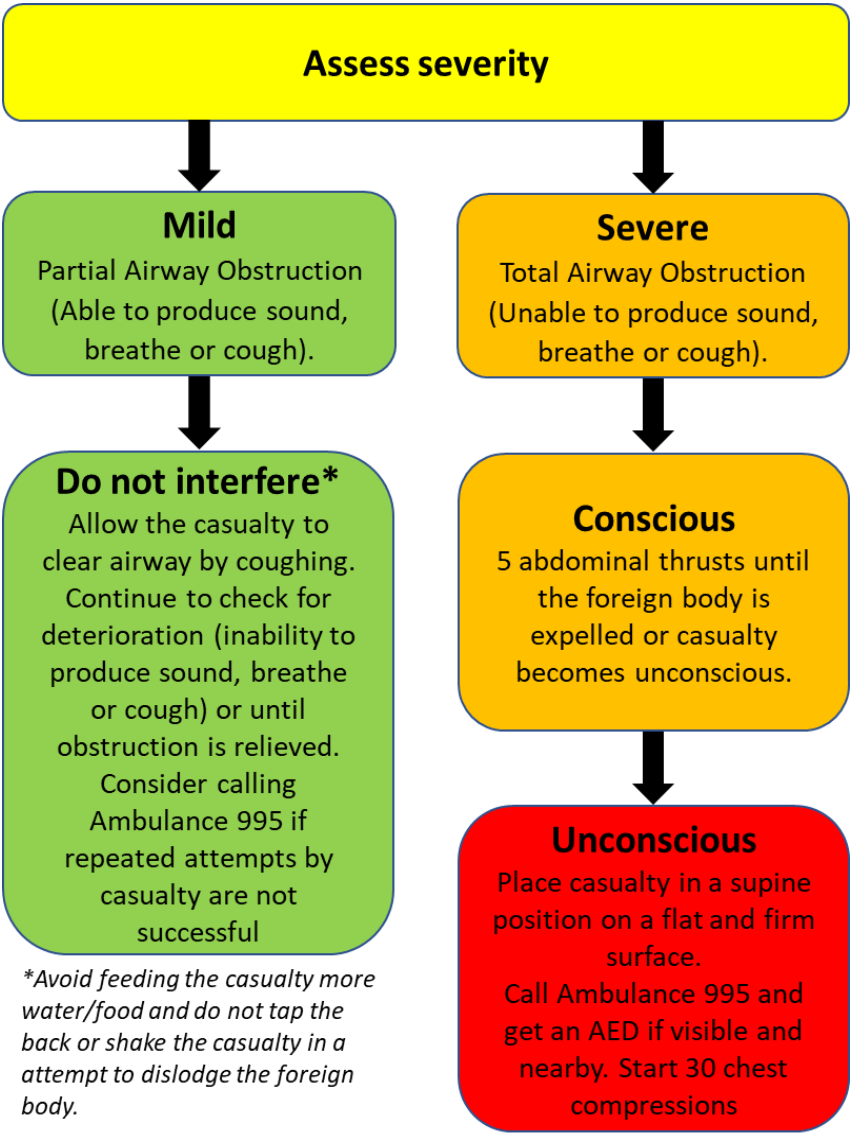
F-2: RECOGNITION OF FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

Foreign Body Airway Obstruction (FBAO) can be either partial or complete. Coughing is the body's natural defence against airway obstruction.

A child with **partial** (mild) airway obstruction will cough in an attempt to expel the foreign body. If the child is wheezing (breathing noisily with a wheezing sound) or coughing, this means that the airway is partially obstructed. Do not interfere. Instruct the child to cough to expel the object himself / herself.

In **complete** (severe) airway obstruction, the child is unable to speak, breathe or cough and may become cyanotic (blue). The child will clutch the neck with the thumb and fingers, the universal distress signal for choking (see figure F1) that requires immediate action (see figure F2).

Figure F1 – Universal sign of choking



**Avoid feeding the casualty more water/food and do not tap the back or shake the casualty in a attempt to dislodge the foreign body.*

Figure F2 – Summary of child FBAO relief

F-3: RELIEF OF CONSCIOUS CHILD FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

The technique used to relieve foreign body airway obstruction is the Heimlich Maneuver (abdominal thrusts).

Step 1: Assessment

- Ask: "Are you choking?" (see figure F3) If the child is choking, the child will not be able to speak, breathe or cough but may nod his/her head. Tell the child that you can help.

Figure F3 – Ask "Are you choking?"

Note:

♥ If the child is able to cough, instruct the child to cough as hard as possible. If child is unable to cough, perform the Heimlich Manoeuvre.

Step 2: Position of rescuer

- If the child is standing, the rescuer stands behind the child (see figure F4).
- If the child is sitting, the rescuer kneels and positions himself/herself behind the child.

Figure F4 – Stand behind the child

Step 3: Locate the landmark

- Put your arms around the child's abdomen.
- Locate the navel.
- Place 2 fingers above the navel and well below the tip of the xiphoid process.
- Make a fist with the other hand with the thumb in the palm.

Figure F5 – Place the fist 2 fingers above the navel

- Place the thumb side of the fist against the child's abdomen, midline and above the 2 fingers' spacing (see figure F5).

Step 4: Heimlich maneuver

Figure F6 – Give quick inward and upward thrusts in one motion

- Lean the child forward with one hand while maintaining the fist against the abdomen.
- Grasp your fist with your other hand.
- Give quick inward and upward thrusts in one motion into the child's abdomen (see figure F6).
- Deliver each thrust firmly and distinctly with the intent of relieving the obstruction until the foreign body is expelled or the child becomes unconscious.

Note:

♥ Usually this procedure will force the foreign object out of the throat and the airway obstruction will be relieved.

F-4: RELIEF OF UNCONSCIOUS CHILD FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

If the child becomes unconscious, proceed with the following steps.

Step 1: Position the child

- Support and position the child lying on his/her back on a firm flat surface.

Figure F7 – Lay the child on a firm and flat surface and get help

Step 2: Activate Emergency Medical Services (EMS)

- If the child is unresponsive, shout loudly for help and immediately call "995" for an emergency ambulance and get AED if visible and nearby. However, if there is another person around, ask him/her to call for an ambulance "995" and get an AED. (see figure F7).

Step 3: Starts 30 chest compressions

- Locate the landmark and perform 30 chest compressions using the same location and techniques used for chest compressions in CPR.

Step 4: Open the airway

- Perform Head-Tilt, Chin-Lift maneuver to open airway (see figure F8).
- While maintaining head-tilt, open the mouth gently to check for visible foreign bodies.
- If foreign body is seen, maintain open airway with chin-lift and insert the index finger of your other hand into the child's mouth along the inside of the cheek.

Figure F8 – Perform a Head-Tilt, Chin-Lift maneuver

- Use a hooking action to dislodge the foreign body and maneuver it out of the mouth. Take care not to force the foreign body deeper into the throat. This maneuver is known as the **finger sweep** (see figure F9).

Figure F9 – Finger sweep

Note:

♥ Do not perform blind finger sweep. Blind finger sweep may push the object back or further into the airway.

Step 5: Mouth-to-mouth breathing

- Check for normal breathing. If there is no normal breathing, attempt to ventilate by performing mouth-to-mouth breathing (1st ventilation) (see figure F10).

Figure F10 – Mouth-to-mouth ventilation

- If there is no resistance, airway is clear. Check for normal breathing and pulse, and if absent, start CPR.

- If there is resistance (chest does not rise), this indicates that the airway may be blocked. Reposition the child's head with the head-tilt and chin-lift maneuver. Re-attempt to ventilate (2nd ventilation).

♥ Do not press deeply into the soft tissues under the chin and do not hyper-extend the neck because this might obstruct the airway.

♥ Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension.

Step 6: Chest compressions

- If there is resistance (chest does not rise) again, perform 30 chest compressions using the same location and techniques used for chest compressions in CPR (refer to steps 6 and 7; page 56 to 58) (see figure F11).

Figure F11 – Provide chest compressions

- Perform the Head-Tilt, Chin-Lift maneuver and check for foreign body.
- Repeat steps 4 to 6 until help arrives and takes over or the child starts breathing, coughing, talking or moving.

For trained healthcare providers

- Check for normal breathing and pulse.
- If normal breathing and pulse are absent or you are unsure, start CPR 30:2.
- If pulse is present and normal breathing is absent, perform rescue breathing at a rate of 20 breaths per minute (one breath every 3 seconds) by giving one breath and counting **2-a-thousand, 3-a-thousand**.
- Repeat the sequence until you have completed a total of 20 breaths. Re-assess for normal breathing and pulse.
- If both the breathing and pulse are present, position the casualty in the recovery position.
- Continue to monitor the casualty's breathing and pulse every 2 minutes as these can stop suddenly.

Summary of Unconscious Child FBAO Relief

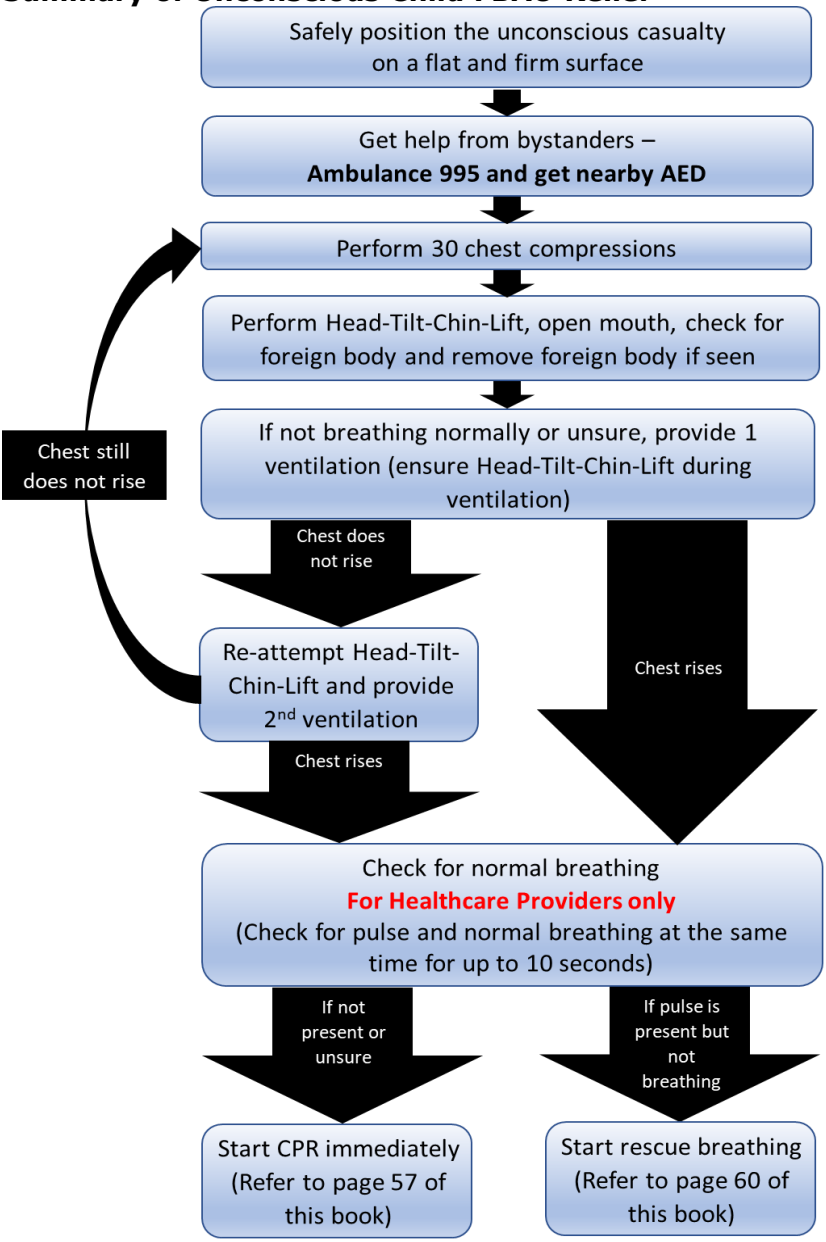


Figure F12 – Summary of Unconscious child FBAO relief

SECTION G

Infant Cardio-Pulmonary Resuscitation (CPR)

G-1: INFANT CPR

G-2: THE LATERAL POSITION (INFANT)

G-1: INFANT CPR

This module addresses the care of infants up to 1 year of age.

Infants rarely collapse due to a primary heart problem. Cardiac arrest is usually secondary to other events, such as major trauma or respiratory illness. Therefore, rescuers must detect and promptly treat early signs of respiratory and circulatory failure to prevent cardiac arrest.

Step 1: Check for danger

- Quickly assess the situation for danger, so that the rescuer operates in a safe environment.

Step 2: Check for responsiveness

Figure G1 – Check for responsiveness

- Tap the infant firmly on his/her shoulder to elicit a response (see figure G1).
- Avoid violent shaking of the infant as this may result in injury.
- Avoid unnecessary movements of the neck to prevent injuries to the head and neck.
- If the infant does not respond, he/she is likely to be unconscious. This may be due to:
    - An airway that is obstructed (blocked) by the tongue that has fallen backwards, food or secretions.
    - Breathing that has stopped.
    - The heart that has stopped beating, usually because of a heart disease.
- If the infant is unconscious, you will have to act quickly.

Step 3: Activate Emergency Medical Services (EMS)

- If the infant is unresponsive, shout loudly for help and immediately call "995" for an emergency ambulance (see figure G2) and get AED if visible and nearby. However, if there is another person around, ask him/her to call for an ambulance "995" and get an AED.

- When calling the EMS, state:
    - Location of the infant.
    - The telephone number you are calling from.
    - What happened (e.g. that an infant is unconscious).
    - Number of casualties.
    - Hang up only after instructed to do so by the dispatcher.

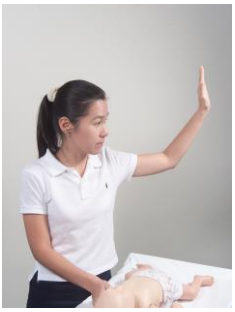


Figure G2 – Get help

Step 4: Position the infant

- For CPR to be effective, the infant must be lying on his/her back and on a firm, flat surface. If the infant is lying face down or on his/her side, you will need to roll the infant over onto his/her back. Do take care that the head, neck and body are supported and turned simultaneously during repositioning.

Step 5: Check for normal breathing

Figure G3 – Check for normal breathing

- **Look** for the rise and fall of the chest (see figure G3).

- Do not take more than 10 seconds.

- It is important to recognize that gasping is NOT normal breathing but a sign of cardiac arrest. Start chest compressions immediately if the infant is gasping.

For trained healthcare providers only

- Locate the brachial pulse (inner aspect of the upper arm, between the infant's elbow and shoulder) with the index and middle fingers of your other hand.
- Apply gentle pressure and feel for the pulse at the same time as checking for normal breathing (see figure G4).

Figure G4 – Check brachial pulse and normal breathing

- Checking of normal breathing and pulse should not take more than 10 seconds.
- If the infant has no pulse, commence chest compressions.
- If unsure about the presence of pulse and no normal breathing, assume cardiac arrest and commence chest compressions.

Step 6: Locate hand position for chest compressions

- Locate the correct hand position for chest compressions:
  - Use your index finger to draw an imaginary line between the nipples to the centre of the sternum (see figure G5).

Figure G5 – Trace location

  - Place your middle (third), and ring (fourth) fingers next to your index finger (see figure G6).

Figure G6 – Place middle and ring fingers next to index finger

- Position the fingers upright.
- Lift up your index finger but maintain the middle and ring fingers on the sternum and commence chest compressions using the pulp of the fingers (see figure G7).

Figure G7 – Prepare for chest compressions

Step 7: Perform chest compressions

- Compress the infant's chest (lower half of sternum) (see figure G8) to a depth of 3 to 4 cm or 1/3 the anterior-posterior diameter counting loudly as you compress:

  1 and 2 and 3 and 4 and **5** and

  1 and 2 and 3 and 4 and **10** and

  1 and 2 and 3 and 4 and **15**

  1 and 2 and 3 and 4 and **20**

  1 and 2 and 3 and 4 and **25**

  1 and 2 and 3 and 4 and **30**

Figure G8 – Compress the lower half of sternum

Figure G9 – Provide 30 chest compressions followed by 2 ventilations

- Perform chest compressions at a rate of 100 to 120 per minute.
- The ratio of chest compressions to ventilations is 30 : 2.
- Perform 5 cycles of 30 chest compressions and 2 breaths within 2 minutes (see figure G9).

Tips for proper chest compressions

- Locating the correct hand position for chest compressions should be done quickly.

- Compress the infant's chest vertically to a depth of 3 – 4 cm, counting loudly as you compress.

- Make sure you allow complete chest recoil before starting the next compression.

- Do not lift the fingers off the chest between each chest compression.

- Keep your head low throughout the CPR cycle (during upstroke and breathing).

♥ If you are unable or unwilling to do mouth-to-mouth ventilations for any reason, please perform continuous chest compressions at the rate of 100 – 120 per minute. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 compressions).

Step 8: Mouth-to-mouth and nose breathing

After 30 compressions, open the airway and perform mouth-to-mouth and nose breathing:

- Perform a gentle head-tilt, chin-lift maneuver. An open airway will ensure mouth-to-mouth ventilations are effective. In the unresponsive casualty, muscle tone is impaired resulting in the tongue falling back and obstructing the airway. As the tongue is attached to the lower jaw, moving the lower jaw forward will lift the tongue away from the back of the throat and open the airway.

- **Head-tilt** – Place one hand on the infant's forehead and the fingers of the other hand under the bony part of the lower jaw.

- **Chin-lift** – Apply firm backward pressure with your palm on the infant's forehead to tilt the head back and lift the jaw forward simultaneously to open the airway. Do not hyper-extend the infant's airway.

- Make a tight seal by placing your mouth over the infant's mouth and nose.

- Give 2 quick and short breaths, each lasting 1 second, into the infant's mouth and nose simultaneously.

- Each breath should be enough to make the chest rise.
- Do not interrupt chest compressions for more than 10 seconds to perform 2 breaths.
- Ventilation volume is 30ml of air.

Note:

♥ Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension and do not hyper-extend the neck as it may cause the airway to kink.

Step 10: Re-assessment

- Check for normal breathing after every 5 cycles of CPR 30:2.
- If breathing is absent or you are unsure about presence of breathing, continue CPR 30:2.
- If there is normal breathing, position the infant in the recovery (lateral) position.
- Continue to monitor the infant's breathing every 2 minutes as it can stop suddenly.

For trained healthcare provider:

- Check for normal breathing and pulse after every 5 cycles of CPR 30:2.
- If normal breathing and pulse are absent or you are unsure, continue CPR 30:2.
- If pulse is present and the infant is not breathing, perform rescue breathing at 20 breaths per minute (one breath every 3 seconds) by giving one breath and count **2-a-thousand, 3-a-thousand"**.
- Repeat the sequence until you have completed a total of 20 breaths. Re-assess for normal breathing and pulse.

- If both breathing and pulse are present, turn the infant to the lateral position.
- Continue to monitor the infant's breathing and pulse every 2 minutes as these can stop suddenly.

G-2: THE LATERAL POSITION (INFANT)

The lateral position (side position) is used in the management of infant who is unresponsive but is breathing and has a pulse. When an unresponsive infant is lying supine (on the back with face upwards), the airway may be obstructed by the tongue, mucus or vomitus. These may be prevented when the infant is placed on his/her side as fluid can drain easily from the mouth.

If there is no evidence of trauma, place the infant on his/her side in the lateral position to keep the airway open. The following steps are recommended:

Step 1: Position the infant

- Place the infant's arms alongside the body.
- Straighten the legs.

Step 2: Roll the infant towards the rescuer

- Support the infant's head and neck with one hand.
- Place the other hand on the infant's hip.
- Gently roll or turn the infant as a unit towards you.
- Support the infant's back with a soft pillow/cushion.
- Ensure that the infant's head is not overextended or flexed.
- Stay with the infant and check his/her breathing continuously.

SECTION H

INFANT
FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

H-1: INTRODUCTION

Complete airway obstruction is an emergency that will result in death within minutes, if not treated immediately. Choking in an infant occurs most commonly during eating or playing.

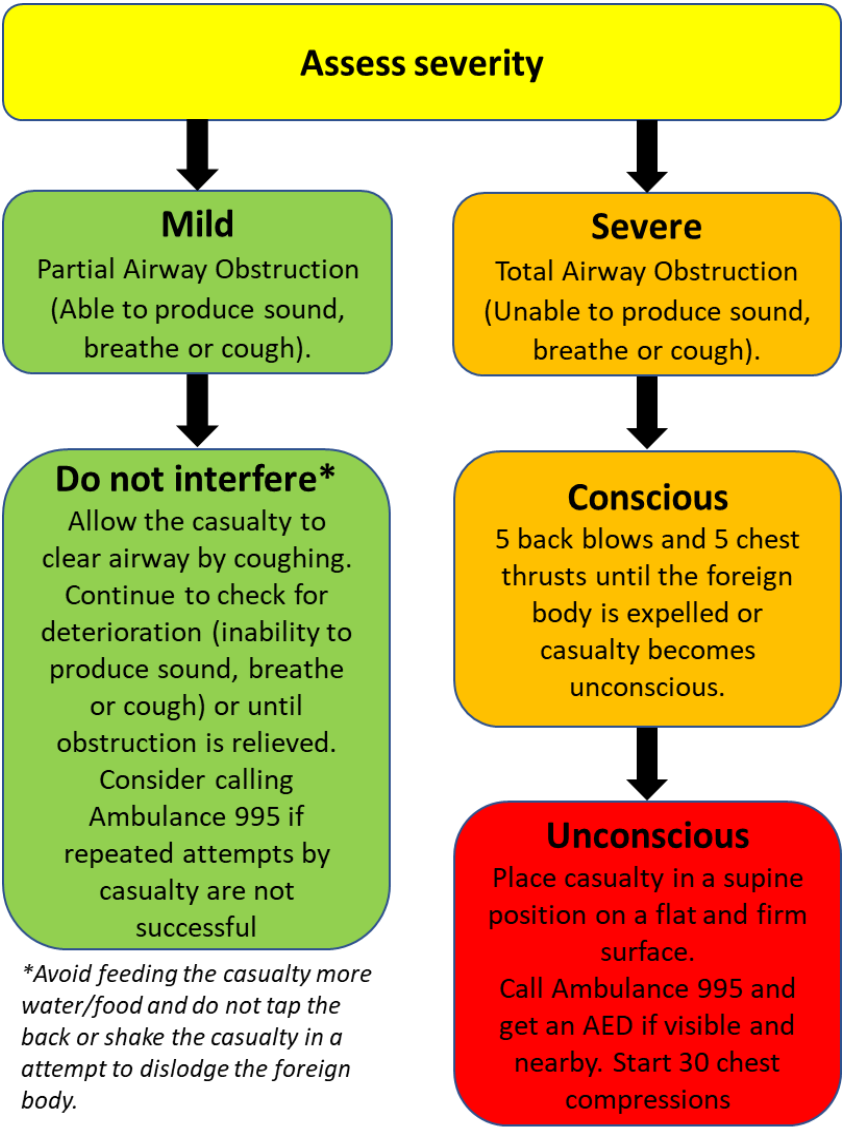
In a witnessed choking event, the chances of survival will increase if the rescuer is able to intervene when the infant is still conscious. The obstructed airway of a conscious infant can be cleared using back blows and chest thrusts.

Precautions

- Do not "force-feed" milk. Allow rest in between.
- Check the teat of the milk bottle prior to feeding. The size may be too large for the infant.
- Cut food into small pieces and feed the infant (if on a weaning diet) small spoonfuls each time.
- Discourage moving about (crawling) or playing while eating.

H-2: RECOGNITION OF FOREIGN BODY AIRWAY OBSTRUCTION (FBAO)

- Choking develops very abruptly and is associated with coughing, gagging or stridor (a high pitched, noisy sound or wheezing).
- If the infant has an infection (e.g. fever, nasal congestion, voice hoarseness), suspect epiglottitis and croup.
- Bring the infant immediately to a hospital as the back blows and chest thrusts technique may not relieve the airway obstruction (see figure H1).



**Avoid feeding the casualty more water/food and do not tap the back or shake the casualty in a attempt to dislodge the foreign body.*

Figure H1 – Summary of infant FBAO relief

H-3: RELIEF OF CONSCIOUS INFANT FOREIGN BODY AIRWAY OBSTRUCTION (FBAO) USING BACK BLOWS AND CHEST THRUSTS

Step 1: Assessment

- Infant is conscious and has stridor.
- If the obstruction is getting worse (complete airway obstruction), you will notice at least one of the following:
    - Loss of voice.
    - Increased breathing difficulty.
    - The infant's face may turn blue.
- Immediately attempt to relieve the airway obstruction.

Figure H2 – Support the head and back of the infant's body

Step 2: Back blows and chest thrusts technique

- Support the head of the infant with your palm and back of the infant's body on your forearm (see figure H2).
- "Sandwich" the infant with your other hand by:
    - Support infant's jaw with your thumb on one side and the rest of your fingers on the other side. Place your forearm on the infant's chest (see figure H3).
    - Support the infant's head and body as a unit.

Figure H3 – "Sandwich" the infant

- Straddle the infant facing down with the head lower than the body (see figure H4).
- Stride one leg (same side as the forearm that is supporting the infant's chest) forward bending at the knee keeping your foot flat on the floor. Do not tip-toe.
- Place the infant's head downwards with the forearm, which is supporting the infant's chest onto your thigh to support the infant.

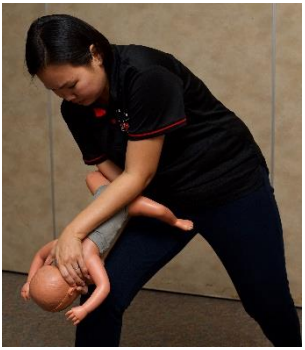


Figure H4 – Straddle the infant facing down with the head lower than the body

- Deliver 5 back blows forcefully between the shoulder blades with the heel of your other hand (see figure H5).

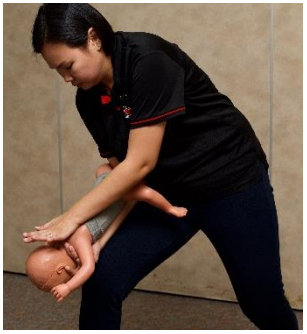


Figure H5 – Deliver 5 back blows between the shoulder blades

- "Sandwich" the infant and turn the infant over with head lower than the body.
- Rest your forearm supporting the infant's back onto your thigh (on the same side as the hand) to support the infant.
- Draw an imaginary line between the nipples with the ring (fourth) finger to the centre of the sternum. Place your middle and index fingers (third and second) next to your ring (fourth) finger (see figure H6).

Figure H6 – Trace location for chest thrusts

- Lift up your ring (fourth) finger and deliver 5 chest thrusts over the lower half of the sternum (breastbone) (see figure H7).

- If a foreign body is seen, place the infant on a firm flat surface and remove the foreign body with your little finger.

- Repeat **Step 2** (Back Blows and Chest Thrusts Technique) until the foreign body is expelled or the infant becomes unconscious.

Figure H7 – Deliver 5 chest thrusts

Note:

♥ Do not tip-toe when performing back blows and chest thrusts as the rescuer may accidentally trip and fall.

♥ Each back blow and chest thrust should be delivered with sufficient force and with the intention of expelling the foreign body.

Other options of supporting the infant with FBAO
(see figures H8 to H11)

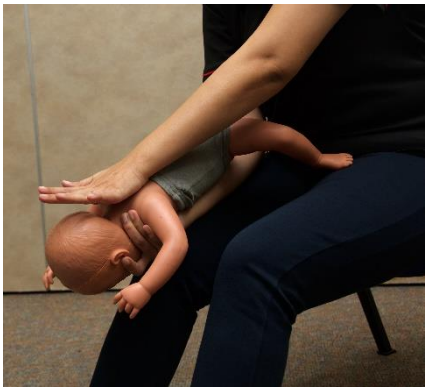



Figure H8 and H9 - Sitting on the chair

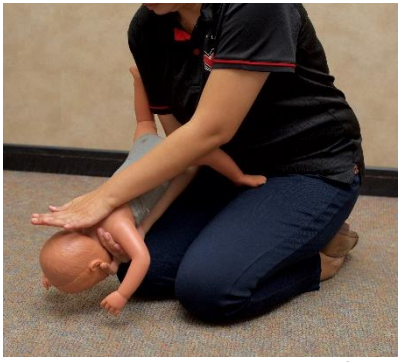



Figure H10 and H11 - Kneeling on the floor

H-4: RELIEF OF UNCONSCIOUS INFANT FBAO

If the infant becomes unconscious, proceed with the following steps.

Step 1: Position the infant

- Support and position the infant lying on his/her back on a firm, flat surface.

Step 2: Activate Emergency Medical Service (EMS)

- If the infant is unresponsive, shout loudly for help and immediately call "995" for an emergency ambulance and get AED if visible and nearby. However, if there is another person around, ask him/her to call for an ambulance "995" and get an AED.

Step 3: Start 30 chest compressions

- Locate the landmark and perform 30 chest compressions using the same location and techniques used for chest compressions in CPR.

Step 4: Open the airway

- Perform the Head-Tilt and Chin-Lift maneuver to open the airway.
- While maintaining Head-Tilt, open the mouth gently to check for visible foreign bodies.
- If a foreign body is seen, maintain open airway with Chin-Lift and insert the little finger of your other hand into the infant's mouth along the inside of the cheek.
- Use a hooking action to dislodge the foreign body and maneuver it out of the mouth. Take care not to force the foreign body deeper into the throat. This maneuver is known as the **finger sweep** (see figure H12).

Figure H12 –Use little finger to remove object

Note:

- Do not perform blind finger sweep. Blind finger sweep may push the object back or further down into the airway.

Step 5: Mouth-to mouth-and-nose ventilation

- Check for normal breathing. If there is no normal breathing, attempt to ventilate by performing mouth-to-mouth-and-nose breathing (1st ventilation) (see figure H13).
- If there is no resistance, airway is clear. Check for normal breathing and pulse, and if absent, start CPR.
- If there is resistance (chest does not rise), this indicates that the airway may be blocked. Reposition the infant's head with the Head-Tilt, Chin-Lift maneuver. Re-attempt to ventilate (2nd ventilation).

Figure H13 – Mouth-to-mouth-and-nose ventilation

- Do not press deeply into the soft tissues under the chin and do not hyper-extend the neck because this might obstruct the airway.
- Too great a volume of air is likely to cause air to enter the stomach and result in stomach (gastric) distension.

Step 6: Chest compressions

- If there is still resistance (chest does not rise), perform 30 chest compressions using the same location and techniques used for chest compression in CPR (refer to steps 6 and 7, Page 75 to 77) (see figure H14).
- Perform the Head-Tilt, Chin-Lift maneuver and check for foreign body.

Figure H14 – Provide 30 chest compressions

- Repeat Steps 4 to 6 until help arrives and takes over or infant starts breathing, coughing, crying or moving.

For trained healthcare provider:

- Check for normal breathing and pulse.
- If normal breathing and pulse are absent or you are unsure, start CPR 30:2.
- If pulse is present and the infant is not breathing, perform rescue breathing at 20 breaths per minute (one breath every 3 seconds) by giving one breath and count **2-a-thousand, 3-a-thousand"**.
- Repeat the sequence until you have completed a total of 20 breaths. Re-assess for normal breathing and pulse.
- If both breathing and pulse are present, turn the infant to the lateral position.
- Continue to monitor the infant's breathing and pulse every 2 minutes as these can stop suddenly.

Summary of Unconscious Infant FBAO

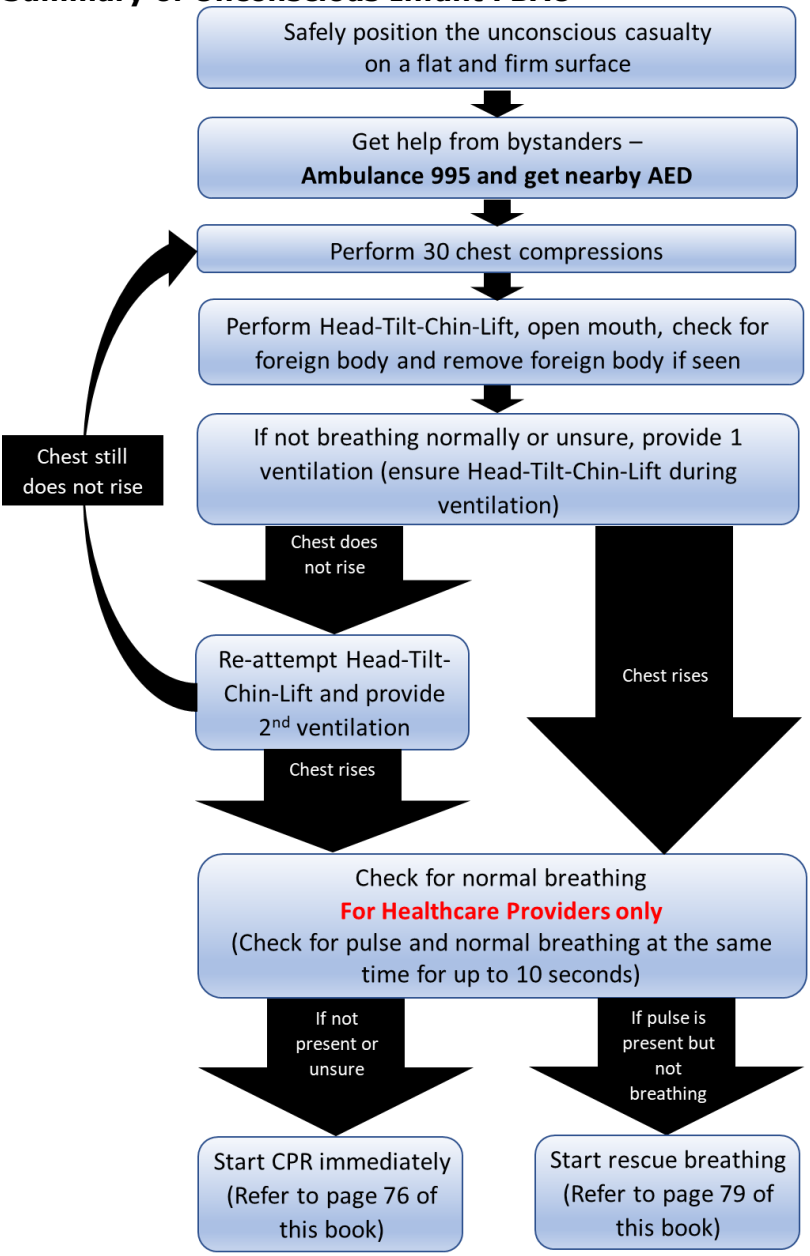


Figure H15 – Summary of unconscious infant FBAO relief

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