

# PAEDIATRIC BASIC LIFE SUPPORT (BLS) FOR HEALTHCARE RESCUERS - SCH

## PRACTICE GUIDELINE<sup>®</sup>

### DOCUMENT SUMMARY/KEY POINTS

- Paediatric BLS guidelines differ from adult guidelines due to the differing aetiology of cardiac arrest and the significant anatomical and physiological differences between infants, children and adults.
- Cardiorespiratory arrest in infants and children can occur in a wide variety of conditions and is usually the result of hypoxia and/or hypovolaemia. Therefore early recognition and management is required to rectify hypoxia and hypovolaemia to reduce the risk of early cerebral injury. Cardiorespiratory arrest in infants and children is rarely from a cardiac origin, as with adults, so oxygen delivery rather than defibrillation is the critical step in BLS.
- Respiratory arrest may occur alone therefore prompt recognition and initiation of expired air resuscitation with oxygen is crucial.
- This document provides guidelines for staff when performing basic life support in the event of cardiac arrest, respiratory arrest or medical emergency.

#### **Responsibilities**

- Clinical staff with direct patient contact.
- All staff whom paediatric BLS is deemed a mandatory skill are required to have their paediatric BLS skills assessed yearly.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

<b>Approved by:</b>	SCHN Policy, Procedure and Guideline Committee	SCH CERS Committee
<b>Date Effective:</b>	1 <sup>st</sup> October 2014	<b>Review Period:</b> 3 year
<b>Team Leader:</b>	Resuscitation Training Consultant	<b>Area/Dept:</b> PaEDS SCH

## CHANGE SUMMARY

- Due for mandatory review – no major changes.

## READ ACKNOWLEDGEMENT

- All clinical staff with potential direct patient contact should read and acknowledge they understand the contents of this document. They need to be familiar with these guidelines and practiced with the skills required.
- **Training/Assessment Required** – Clinical Staff with direct patient contact have a mandatory requirement to be assessed as competent in the delivery of paediatric basic life support according to these current guidelines on an annual basis.
- Local managers are required to identify staff with a mandatory knowledge and assessment requirement under these procedures, notify them of the publication of this document and keep records of staff having read and acknowledged the content.

### **This document is to be read in conjunction with the following:**

NSW Health PD 2007\_036 "[Infection Control Policy](#)"

NSW Health PD 2011\_077 "[Recognition & Management of a patient who is clinically deteriorating](#)"

SCH.C.2.B.2 "Guidelines use of single patient use self-inflating bag and Mask Devices"

SCH "[Between the Flags: Clinical Emergency Response System - SCH](#)"

SCH.C.2.03 "End of Life Care Plan"

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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## Definition of Terms:

### **Age definitions:**

- A neonate is up to 28 days of age,
- An infant is less than 1 year of age,
- A child is between 1 year and puberty.

### **Age definitions in relation to BLS at SCH, Randwick**

- Neonates follow the infant guidelines,
- A child is defined as all paediatric patients from 1-18 years.

### **Basic Life Support (BLS):**

- The preservation of life by the initial establishment of and/or maintenance of airway breathing, circulation and related emergency care.

### **Cardiac Arrest:**

- Cessation of heart function.

### **Defibrillation:**

- The application of a controlled electric shock to the heart through the chest wall in order to stop a cardiac arrhythmia (ventricular fibrillation or ventricular tachycardia). The aim of the shock is to restore the hearts function.

### **External Cardiac Compressions:**

- Rhythmic pressure applied through the sternum during cardiac arrest in an attempt to circulate blood around the body.

### **Finger Sweep:**

- Using the fingers in an attempt to dislodge a foreign body from the mouth or throat of an unconscious person.

### **Head tilt/chin lift manoeuvre:**

- The backward tilt of the head and upward lift of the chin used to open the airway.

### **Jaw thrust manoeuvre:**

- The forward pressure applied behind the bony part of the jaw to move the jaw upwards and away from the chest in order to open the airway in an unconscious person.

### **Poor perfusion:**

- This describes a state in which blood flow to the tissues is significantly decreased and may be insufficient to sustain vital functions.

### **Unconscious:**

- Unconscious is a state of unrousable unresponsiveness, where the victim is unaware of their surroundings and no purposeful response can be obtained.

## 1 Introduction

Paediatric BLS guidelines differ from adult guidelines due to the differing aetiology of cardiac arrest and the significant anatomical and physiological differences between infants, children and adults.

Cardiorespiratory arrest in infants and children can occur in a wide variety of conditions and is usually the result of hypoxia and/or hypovolaemia. Therefore early recognition and management is required to rectify hypoxia and hypovolaemia to reduce the risk of early cerebral injury. Cardiorespiratory arrest in infants and children is rarely from a cardiac origin, as with adults, so oxygen delivery rather than defibrillation is the critical step in BLS<sup>1</sup>.

Respiratory arrest may occur alone therefore prompt recognition and initiation of expired air resuscitation with oxygen is crucial.

Examples of conditions that may lead to significant hypoxia and hypovolaemia in infants and children include:

- Severe respiratory illness and airway obstruction (bronchiolitis, croup, whooping cough, asthma),
- Sepsis
- Dehydration
- Drowning
- Anaphylaxis
- Congenital cardiac disease
- Trauma and accidents (head injuries)
- Drug overdose.

The outcome for infants and children following cardiac arrest is in general poor, therefore early recognition and response to signs of clinical deterioration using the Between the Flags program is essential. Refer to Recognition and Management of a Patient who is Clinically Deteriorating [PD2011\_077]

*For further information on paediatric resuscitation access ARC Guideline 12.1 and 12.2:*

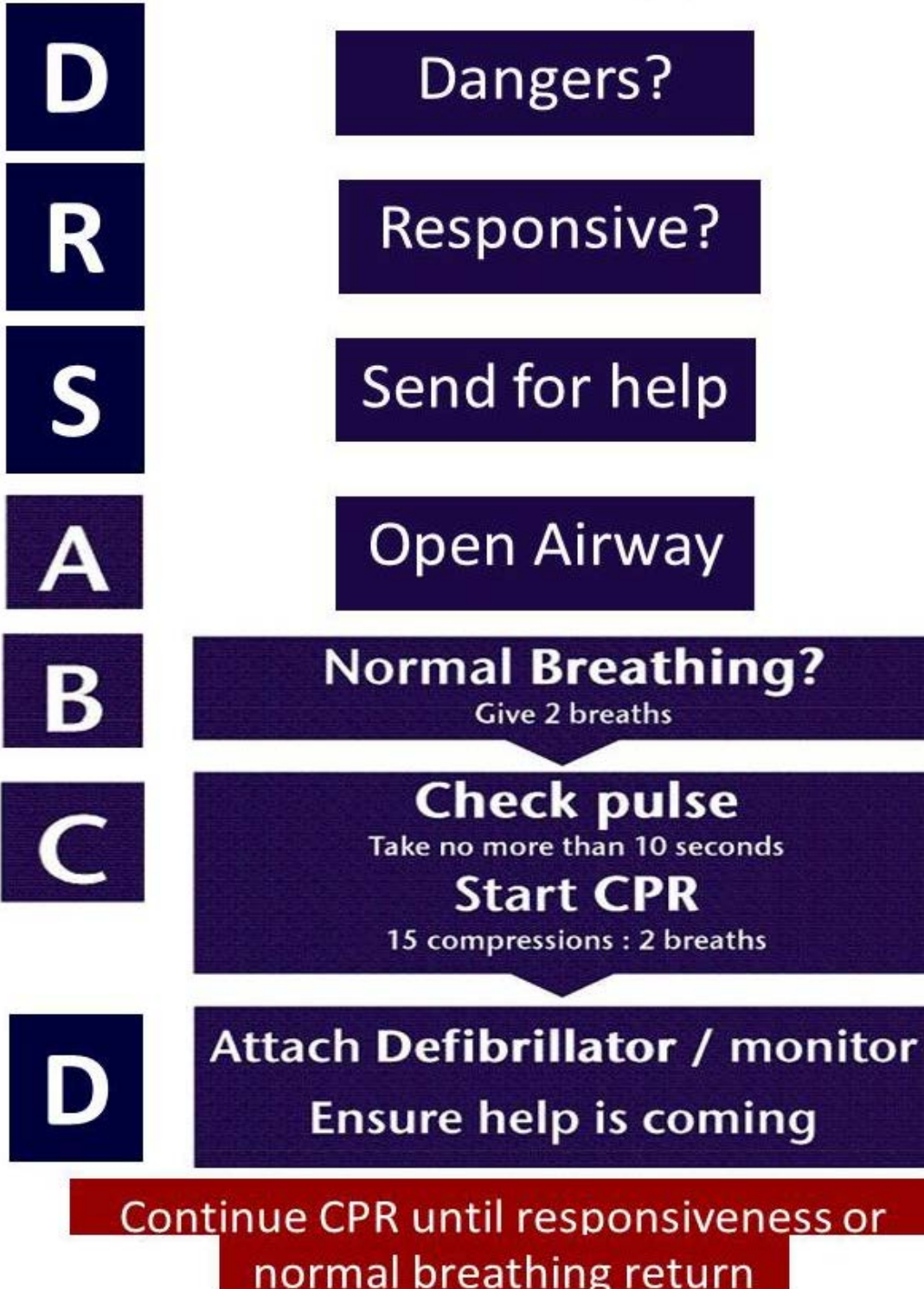
<http://www.resus.org.au/>

Although some key points of adult basic life support are also covered in this guideline, the predominant cause of an adult arrest is of cardiac origin and access to early defibrillation is crucial, for further information on adult basic life support access [ARC Guidelines](#):<sup>3,7,8</sup>

In the event of a presumed cardiac arrest assistance should be summonsed and resuscitative measures must be commenced immediately by healthcare professionals. The only exception to this is when a current 'not for resuscitation' order is present in the patient's medical record (please refer to SCH [End of Life Care Plan](#))



# Basic Life Support



April 2011. Modified from Australian Resuscitation Council and New Zealand Resuscitation Council for use by trained health professionals. Original ARC/NZRC algorithm available at [www.resus.org.au](http://www.resus.org.au)

**Figure 1: Paediatric Basic Life Support Algorithm<sup>1</sup>**

## **If someone collapses in your presence, or you find someone collapsed, take the following steps**

### **D - DANGERS**

Assess situation quickly, check for danger and remove the patient and yourself to a safe environment if necessary (ARC, 2010, Guideline 2).

### **R - RESPONSIVE**

Assess the collapsed person's response to verbal and tactile stimuli, ensuring that it doesn't cause or aggravate an injury (ARC, 2010, Guideline 3).

- Ask them 'are you alright?' and gently apply a stimulus.
- Infants and children who cannot talk yet, and older children who are scared are unlikely to reply but may make a sound or open their eyes to the rescuers voice or touch.<sup>1</sup>

#### If there is no response, then

### **S- SEND FOR HELP**

- Shout for help or press the emergency buzzer.
- Note the time.
- Assess airway, breathing and circulation.
- If more than one rescuer is present one person should start Basic Life Support whilst another should dial the SCH emergency number.

## **Activate the Code Blue Page DIAL 777**

### **And state**

1. There is a CODE BLUE
2. The ward or location
3. Whether the victim is a child or an adult

- Other ward staff should immediately take the resuscitation trolley to the patient's bedside
- If there is only one person and no help has arrived after 1 minute of CPR then the rescuer must briefly leave the patient to activate the CODE BLUE response themselves and then return and resume CPR.

## A- Open AIRWAY

### Opening the airway

When a child is unconscious, all muscles are relaxed. If the infant/child is lying on their back the tongue falls against the back of the throat and obstructs the airway.

To open the airway:

- Lay infant/child flat on their back on a firm surface (do not roll onto side).
- Apply head tilt/chin lift or jaw thrust manoeuvre.

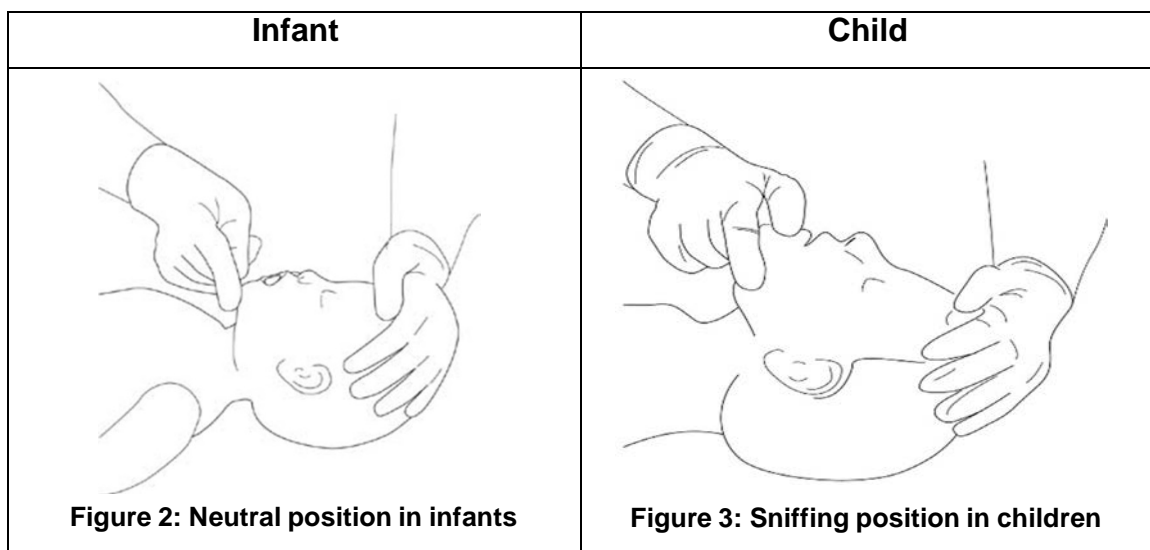
### **Head Tilt/Chin Lift Manoeuvre**

The simplest way of ensuring an open airway in an unconscious person is to use the head tilt chin lift technique, there by lifting the tongue from the back of the throat. The best way to perform this manoeuvre is to place one hand on the infant/child's forehead and gently tilt the head back.

The desired degree of tilt is:

- Neutral position in an infant
- Sniffing position in the child

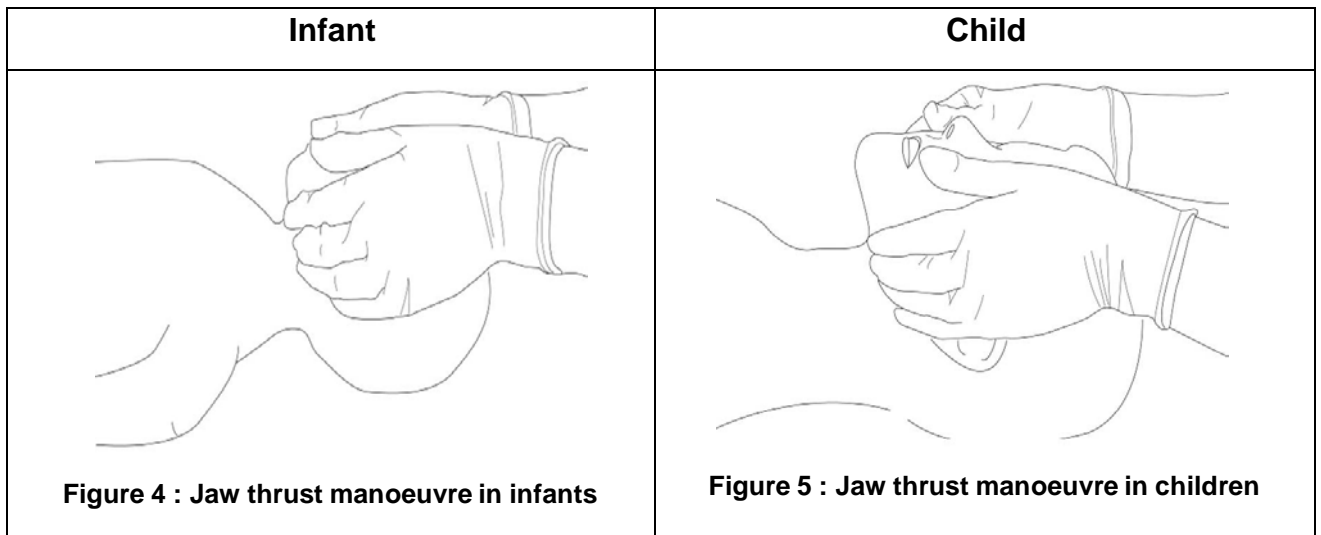
The upper airway in infants is easily obstructed because of the narrowness of the nasal passages, the entrance to the vocal cords and the trachea. The trachea is soft and pliable and may be obstructed by excessive backward head tilt or jaw thrust. Therefore in infants the head should be kept neutral and maximum head tilt should not be used. The lower jaw should be supported at the point of the chin and the mouth maintained open (ARC, 2010, Guideline 4).





### ***Jaw Thrust manoeuvre***

- If the head tilt/chin lift is not possible or contraindicated the jaw thrust manoeuvre can be performed.
- In this manoeuvre the jaw is displaced forward, pulling the tongue away from the back of the throat:
  - Position yourself behind the head of the infant/child.
  - Place two or three fingers of each hand behind each side of the infant/child's mandible and lift the jaw upwards.
  - This technique may be easier if the rescuers elbows are resting on the same surface as the child is lying on.
  - A small degree of head tilt may also be applied if there is no concern about neck injury APLS 2011



### ***Clearing the airway***



- The airway must be cleared of food, saliva, vomit, blood or loose teeth.
- If necessary remove any visible solids using gloved hands.
- Use suction if available to clear the airway. If suction not available roll person on to their side if safe to do so and drain fluid from the mouth.
- A **blind finger sweep technique should NOT be used in children**. The child's soft palate is easily damaged, and bleeding from the mouth can worsen the situation. Foreign bodies may also be forced further down the airway and will be difficult to remove (APLS, 2011).

## B- Normal BREATHING

Once the airway is cleared and open, check for normal breathing for a period of up to 10 seconds using the following methods.

- Look for movement of upper abdomen or lower chest
- Listen for the escape of air from nose and mouth
- Feel for movement of the chest and upper abdomen (ARC, 2010, Guideline 5).

The rescuer should distinguish between adequate breathing and ineffective, gasping or obstructive breathing. **If in doubt, attempt rescue breathing** (APLS, 2011)

If Breathing Normally	If Breathing is absent / not normal
<ul style="list-style-type: none"> <li>• Place infant/child in the recovery position.</li> </ul>  <p style="text-align: center;"><b>Figure 6 : Recovery position</b> (AHA, 2005)</p> <ul style="list-style-type: none"> <li>• Check for continued breathing and administer oxygen via mask at a flow rate of up to 15 litres/minute, if available.</li> <li>• Stay with the child until code blue team arrives.</li> </ul> <p style="text-align: right;">(APLS, 2011)</p>	<ul style="list-style-type: none"> <li>• Ensure infant/child is on a firm surface;</li> <li>• Using a barrier or bag-valve-mask device (see: Section 2), <b>give 2 breaths</b>. These breaths should be delivered slowly over 1-1.5 seconds' duration in order to reduce gastric distension (APLS, 2011).</li> </ul>  <p style="text-align: center;"><b>Figure 7: Mouth to mask method in an infant</b></p> <ul style="list-style-type: none"> <li>• If there is an oxygen source available attach it to the mask at a flow rate of up to 15 litres/minute (Laerdal).</li> <li>• Deliver a breath of sufficient volume to see the chest rise. <b>Note:</b> If the chest does not rise recheck head tilt and chin lift; recheck mask seal; and do not attempt more than two breaths each time before commencing or returning to chest compressions.</li> <li>• Care should be taken not to use too much force to inflate lungs. If excessive force is used there is a risk that air will inflate the stomach resulting in regurgitation of stomach contents and aspiration into the lungs. (ARC, 2010, Guideline 5).</li> </ul>

## C- Assess CIRCULATION (Check pulse/Start CPR)

### Assessment

Failure of the circulation is recognised by:

- The absence of signs of circulation i.e. no normal breaths or cough in response to resuscitation breaths and no spontaneous movement.
- In addition, an absent central pulse (for up to 10 seconds) or the presence of a pulse at an insufficient rate may be detected (APLS, 2011).

### Pulse Check

Health care personnel may use pulse palpation in their assessment but even experienced health professionals can find it difficult to be certain that the pulse is absent within 10 seconds. If a pulse cannot be confidently identified within 10 seconds, or there is uncertainty CPR should be commenced (ARC, 2010, Guideline 12.2: APLS, 2011).

The pulse is best assessed in the following locations:

- Infants – brachial or femoral artery
- Child/Adult- carotid, femoral or brachial artery



**Figure 8 : Brachial Pulse**

### Rescue breathing without chest compressions

If circulation is adequate, recheck the patients breathing and if adequate breathing has not resumed then continue with rescue breathing without chest compressions using a barrier or bag- valve-mask device. A rate of 12-20 breaths per minute (1 breath every 3-5 seconds) using the higher rate for the younger child should be used<sup>5</sup>.

### Chest compressions should be commenced if:

- The infant/child is unresponsive and not breathing normally
- The pulse is not palpable or cannot be identified within 10 seconds, or there is a slow pulse of less than 60 beats per minute (with signs of poor perfusion)<sup>1</sup> (ARC Guideline 12.2, 2010)

### Chest Compressions are performed as follows:



- The infant/child should be on a flat hard surface (use a cardiac arrest board);
- Children and rescuers vary in size; the method of chest compressions should reflect this;
- For all age groups compress over the lower half of the sternum, this equates to the 'centre of the chest';

- For all age groups compress the sternum approximately one third of the depth of the chest;
- Compression time should equal release time i.e. 50% down motion, 50% up motion, smoothly and rhythmically. Do not remove your hands from the sternum during compressions;
- Kneel or stand vertically over the child/adult so that your shoulders are over the sternum and your arms are straight;
- Interruptions to compressions should be minimised, as this is associated with lower survival rates (ARC, 2010).

The following techniques should be used for chest compressions.

### **Compression Techniques: Infants:**

For single rescuer use the tips of two fingers, press down on sternum approximately one third of the depth of infant's chest. This technique is preferred for single rescuers in order to minimise the transition time between chest compressions and ventilations (ARC, 2010, Guideline 6)

Infant-Single rescuer	Infant – 2 or more rescuers
 <p data-bbox="220 1554 836 1630"><b>Figure 9 : Finger placement for compressions in infants</b></p>	 <p data-bbox="874 1554 1490 1637"><b>Figure 10: Two thumb encircling hand technique for cardiac compressions in infants</b></p>



If there are 2 or more rescuers use the encircling technique:

- Place both thumbs flat side by side on lower half of sternum with tips pointing to infants head;
- Spread the rest of both hands with the fingers together to encircle the lower part of the infants rib cage with the tips of fingers supporting the infants back;

- Press down on the sternum applying pressure through the thumbs to depress it approximately one third the depth of the infant's chest;
- Care should be taken to avoid restricting chest expansion during inspiration. <sup>4</sup>

**Compression Techniques: Children**

Chest compressions can be performed using either the heel of one hand or the two handed technique. The rescuer should choose the most appropriate method, depending on the size of the child and the size of the rescuer, to compress the sternum one third the depth of the chest.

Compressions in Children	Compressions in Children/Adults
<p>To perform chest compressions on children over 1 year.</p> <ul style="list-style-type: none"> <li>• Place the heel of one hand over the lower half of the sternum;</li> <li>• Lift the fingers to ensure that pressure not applied over the child's ribs.</li> </ul>  <p><b>Figure 11: Hand placement for one-hand technique</b></p>	<p>In larger children and adults or for small rescuers the two handed technique should be used.</p>  <p><b>Figure 12 : Hand placement for 2 hand technique</b> (<a href="#">ERC, 2005</a>)</p>

**Rate of compressions**

- For all age groups compression rate should be 100 times per minute.
- Note that this does not imply that 100 compressions will be delivered each minute since the number will be reduced by interruptions for breaths (ARC, Guideline 6, 2010).

**Ventilation to Compression Ratio**

- For all infant and paediatric patients the ratio is 15 compressions : 2 ventilations
- For all adults the ratio is 30 compressions : 2 ventilations

The single healthcare professional rescuer may also perform a ratio of 30:2 for infants and children if they find difficulty in the transition from compressions to ventilations.<sup>1</sup>

**Points on ventilation: compressions**

- The compressions should pause while the ventilation is delivered for a non-intubated patient. Compressions can be recommenced at the end of the second inspiration<sup>1</sup>.
- Once an advanced airway has been secured (i.e. tracheal intubation) continue compressions uninterrupted. Care should be taken to avoid hyperventilation and ventilations should be delivered at 8-10 breaths per minute without interrupting compressions<sup>5</sup>.
- Note that performing chest compressions is tiring; it is therefore recommended that the person doing compressions be changed every 2 minutes or when he/she becomes fatigued (ARC, 2010, Guideline 6).

**Duration of CPR**

Rescuers should minimise interruptions of chest compressions and CPR should not be interrupted to check for response or breathing. Interruption of chest compressions is associated with lower survival rates (ARC, Guideline 8, 2010).

**Cardiopulmonary resuscitation should continue until:**

- The victim responds or begins breathing normally
- Qualified help arrives and takes over CPR
- An authorised person directs that CPR be ceased. (ARC, 2010, Guideline 8)

**D- DEFIBRILLATOR (Attach defibrillator/monitor: Ensure help is coming)**

The use of automated external defibrillators (AEDs) is now included in basic life support teaching for adults because early defibrillation is the most effective intervention for the large majority of unpredicted cardiac arrests in adults. In infants and children circulatory or respiratory causes predominate. The use of AED's / defibrillator is not covered in the paediatric basic life support guideline.

**Cardiorespiratory Monitoring**

It is essential that cardiorespiratory monitoring is commenced as soon as possible either displayed using chest leads or defibrillator pads to enable differentiation of the ECG rhythm and initiation of advanced life support therapies. All ward areas within SCH have the capacity to initiate ECG monitoring.

### **Location of Zoll Defibrillators in SCH**

Zoll M Series® defibrillators are available on all levels of Sydney Children's Hospital, Randwick.

Level	Ward	
Level 0	Outpatients Department	Zoll M Series
Level 0	Respiratory Medicine	Zoll R Series
Level 1	Emergency Department	Zoll M Series
Level 1	Intensive Care	Zoll M Series x 2
Level 1	Short Stay Surgical	Zoll R Series
Level 1	Paediatric Recovery	Zoll M Series
Level 2	C2 South	Zoll M Series
Level 2	C2 North	Zoll M Series
Level 3	C3 West	Zoll M Series

In areas where there is no defibrillator on the resuscitation trolley the porter response on the code blue team can be directed to collect the defibrillator from the closest location.

### **Ensure help is coming**

**Note:** If, after 1 minute of CPR, no help has arrived the rescuer must ensure the code blue has been called.

## **Summary**

BLS Component	Infant < 1 year	Child 1-18yrs (SCH inpatient)	Adult
<b>Airway position</b>	Neutral	Sniffing	Sniffing
<b>Pulse check</b>	Brachial or femoral	Carotid, brachial or femoral	Carotid, brachial or femoral
<b>Initial breaths</b>	2 breaths	2 breaths	30 compressions then 2 breaths
<b>Chest compression Location</b>	Lower half of sternum	Lower half of sternum	Lower half of sternum
<b>Depth of chest compression</b>	Depress sternum 1/3 <sup>rd</sup> chest depth	Depress sternum 1/3 <sup>rd</sup> chest depth	Depress sternum 1/3 <sup>rd</sup> chest depth
<b>Chest compression technique</b>	<b>Single rescuer:</b> 2 fingers  <b>Two rescuers:</b> Two thumbs encircling	Heel of one hand or two handed Depending on <ul style="list-style-type: none"> <li>• size of child</li> <li>• small rescuer</li> </ul>	Two handed technique
<b>Chest compression rate</b>	100 per minute	100 per minute	100 per minute
<b>Chest compression : Ventilation Ratio</b>	15:2	15:2	30:2

## 2 Airway Management

Resuscitation/barrier devices must be used during cardiopulmonary resuscitation to prevent direct contact between the mouth of the resuscitator and the person being resuscitated. Individual resuscitation devices (masks) must be available and accessible in all patient care areas<sup>7</sup>.

In the event of an emergency where a barrier device is not available the mouth to mouth or mouth to mouth and nose may be required.

### Rescue Breathing

Four methods are used for rescue breathing

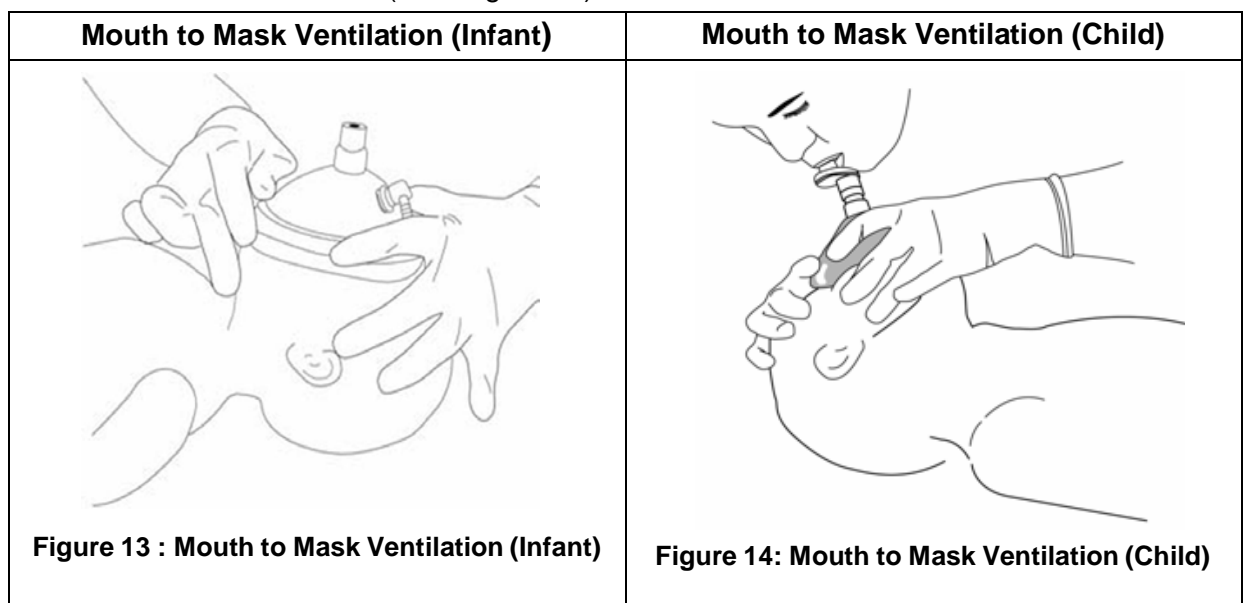
- Mouth to mask;
- Mouth to Mouth;
- Mouth to mouth and nose;
- Bag Valve Mask (BVM);

#### ***Mouth to Mask resuscitation***

This method can be used until a BVM is available and help arrives to secure a definitive airway. Pocket masks are located at ward bed spaces.

#### **Method:**

- Position yourself at infant/child's head.
- Apply oxygen to inlet if immediately available at 15 litres per minute flow.
- Apply the mask either:
  - Upside down in infants (see: Figure 13).
  - As for adults in children (see: Figure 14).







### Mouth to Mask resuscitation (ctd)

- Place mask (with filter/one way valve attached) over infant/child's mouth and nose (this will cover majority of face in infants).
- Place mouth around filter/valve attached to the mask.
- Blow through filter/valve giving enough volume to see the infant/child's chest rise  
N.B. Allow time for infant/child to exhale before delivering next breath.
- If chest does not rise re-check head tilt, chin lift and mask seal. (ARC, 2010, Guideline 5)

### ***Mouth to Mouth and Nose method (under 1 year)***

This method should only be used in the event of an emergency where no barrier device is available:

- Maintain open airway in neutral position using head tilt/chin lift.
- Take a breath, seal lips around the outside of the infant's mouth and nose ensuring an airtight seal.
- Deliver two breaths of sufficient volume to make the chest rise as much as normal. Allow about 1-1.5 seconds for each breath.
- Remove your mouth to allow exhalation, watch the chest fall.
- If the chest does not rise then the airway is not clear. Check and re-open the airway, check the seal of your mouth and try again.

<b>Mouth to Mouth and Nose (Infant)</b>	<b>Mouth to Mouth (Child/Adult)</b>
 <p data-bbox="255 1691 837 1769"><b>Figure 15 : Mouth to Mouth and Nose position</b> (<a href="#">APLS, 2011</a>)</p>	 <p data-bbox="933 1713 1396 1758"><b>Figure 16 :Mouth to Mouth in a child</b></p>

**Mouth to Mouth method (over 1 year)**

This method should only be used in the event of an emergency where no barrier device is available.

- Maintain open airway with head tilt/chin lift.
- Pinch nostrils with thumb and forefinger of hand maintaining the head tilt.
- Take a breath and place mouth over victim's mouth, ensuring an airtight seal.
- Deliver two breaths of sufficient volume to make the chest rise as much as normal. Allow about 1-1.5 seconds for each breath.
- Remove your mouth to allow exhalation, watch the chest fall.
- If the chest does not rise then the airway is not clear. Check and re-open the airway, check the seal of your mouth and try again.

**Bag - Valve - Mask Ventilation**

- Bag-valve-mask ventilation is used to provide positive pressure ventilation in infants and children with respiratory failure /inadequacy.
- This device is comprised of a self-inflating bag and a non-rebreathing valve attached to a facemask. There is also the ability to have oxygen inflow and an oxygen reservoir to enable delivery of high flow oxygen<sup>8</sup>.
- This complex piece of equipment requires considerable education and practice for use. Personnel using the device must be familiar with its structure and function and may only initiate manual ventilation if they have attained competency in bag-valve-mask ventilation.

**Self-inflating bags at SCH come in three sizes**

- The 250mL bag is reserved for use in intubated neonates <1.5kg only (located in ICU,ED and Recovery only);
- The 500mL bag is for infant and children under 30kgs;
- The 1500mL is for children over 30kgs.

Note recommended weight ranges for BVM systems may differ please check individual equipment recommendations.

The paediatric and neonatal bag-valve-mask devices usually have a special pressure relief (pop- off) valve which is set at approximately 40-45cm H<sub>2</sub>O. This valve prevents the delivery of excess pressures to the child's lungs and decreases the risk of pneumothorax or stomach distension. This valve may be overridden under the supervision of a medical officer to permit use of high pressures to achieve visible chest expansion in patients with upper or lower airway obstruction or poor lung compliance<sup>1</sup>.

The self-inflating bag delivers only room air (21% oxygen) unless supplementary oxygen is attached. To deliver consistently higher oxygen concentrations the device should have an oxygen reservoir attached and maintain an oxygen flow of at least 10 to 15L/min into the reservoir of the 500mL bag and at least a flow rate of 15L/min into the 1500mL bag<sup>2</sup>.

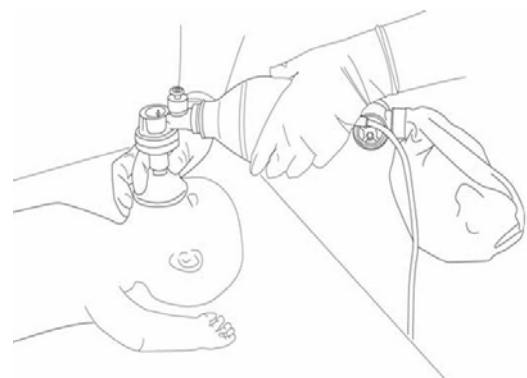
## Precautions

The rescuer should only use enough force and tidal volume to make the chest rise visibly, excessive ventilation during cardiac arrest should be avoided because:

- It increases intrathoracic pressure, which impedes venous return, thus reducing cardiac output and cerebral and coronary blood flow.
- In patients with small-airway obstructions (e.g. asthma and bronchiolitis), excessive tidal volume and ventilation rate can result in air trapping, barotraumas and air leak.
- It also increases the risk of stomach inflation, regurgitation and aspiration. <sup>5</sup>

## Technique for the use of the self-inflating bag-valve-mask systems

- Wear personal protective equipment.
- Select a bag and mask of appropriate size. The mask must be able to completely cover the victim's mouth and nose without covering the eyes or overlapping the chin.
- Connect to an oxygen supply.
- Open the patient's airway using the head tilt/chin lift manoeuvre or jaw thrust if spinal injury suspected;
- Position the mask on the face ensuring a good seal to the face;
- Place your thumb and forefinger in a "C" shape over the mask and exert downward pressure on the mask and position third, fourth and fifth fingers along the infant/child's jaw. Compress the ventilation bag with the other hand until the chest visibly rises (see: Figure 17).
- In larger children a two handed technique may be required if there are two rescuers.
- Observe for bilateral rise of the chest, and allow for passive exhalation.
- Where cardiac compressions are in progress ventilation with a self inflating bag mask system **must be coordinated during the pause in compressions** (ARC, 2010, Guideline 12.2).
- If the victim has a perfusing rhythm (i.e. pulses are present) but no breathing, give breaths at a rate of 12-20 per minute (1 breath every 3-5 seconds) <sup>5</sup>.
- In spontaneously breathing patients ensure synchrony with patient effort.



### Figure 17: Bag-valve-mask ventilation

- Assess effectiveness of ventilation throughout procedure. In most instances bag- valve-mask ventilation provides an adequate means of assisted ventilation.
- Regardless of how effective bag-valve-mask ventilation is achieved, some degree of gastric inflation will occur. If the abdomen becomes distended with bag-valve- mask ventilation, the passage of a nasogastric tube may be required to decompress the stomach.

### 3 Management of Foreign Body Airway Obstruction

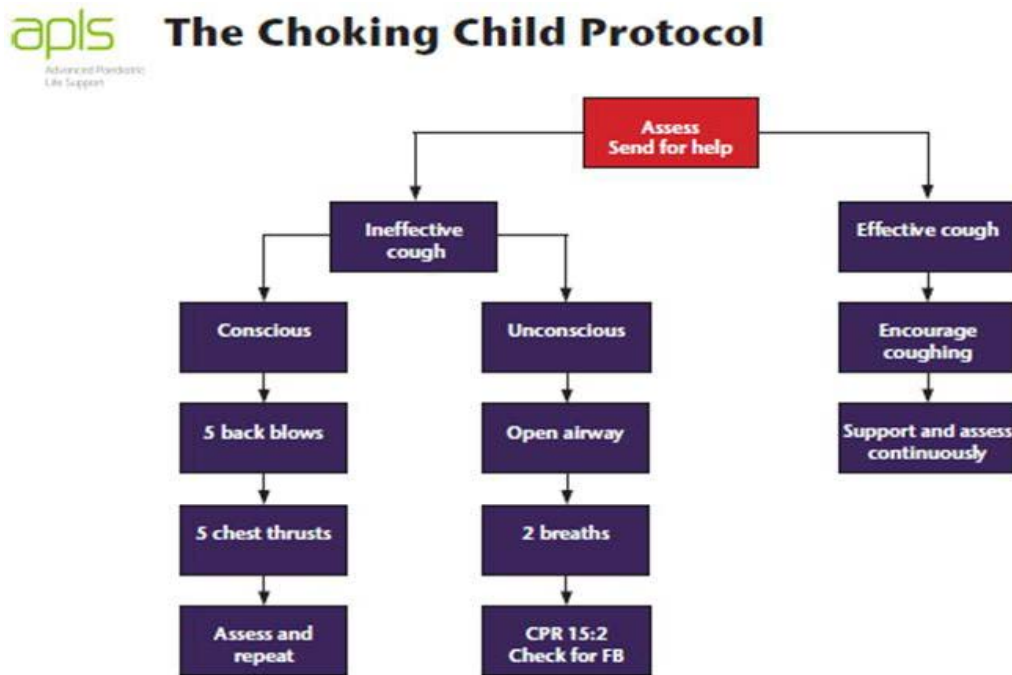
The diagnosis of a foreign body airway obstruction (FBAO) may not be clear cut but should be suspected if the onset of respiratory compromise is sudden and is associated with coughing, gagging and stridor<sup>1</sup>.

Airway obstruction may also occur with infections such as acute epiglottitis and croup, in these cases attempts to relieve the obstruction using methods below are dangerous.

If a foreign body is easily visible and accessible in the mouth then remove it taking care not to push it further into the airway. DO NOT perform a blind finger sweep of the mouth or upper airway as this may further impact a foreign body and damage tissues without removing the object.

The following physical methods of clearing the airway should only be performed if:

- The diagnosis of foreign body aspiration is clear-cut (witnessed or strongly suspected) and ineffective coughing and increased shortness of breath, loss of consciousness or apnoea have occurred.
- Head tilt/chin lift and jaw thrust have failed to open the airway of an apnoeic child. The sequence of actions for management of FBAO is shown below in Figure 18.



**Figure 18: Foreign body airway obstruction sequence<sup>1</sup>**

#### The FBAO sequence

If the child shows signs of an effective cough they should be encouraged to cough, reassured, kept calm and observed continuously but do nothing else. Place the child upright in a position they feel most comfortable and call for assistance.

No intervention should be made unless the cough becomes ineffective, that is quieter or silent, and the victim cannot cry, speak or take a breath or they come cyanosed or start to lose consciousness. Then call for help and start the intervention<sup>1</sup>.

A combination of back blows and chest thrusts are recommended (as shown in Figure 18).

**Back Blows: In an infant**

- Support them in a head downwards, prone position to enable gravity to assist removal of the foreign body;
- A seated or kneeling rescuer should be able to support the infant safely across their lap;
- Support the infants jaw in such a way as to keep the airway open in the neutral position;
- Deliver up to five sharp back blows with the heel of one hand in the middle of the back between the shoulder blades;
- Check to see if each back blow has relieved the airway obstruction.

**Back Blows: In a child over 1 year of age**

- Back blows are more effective if the child is positioned head down;
- A small child may be placed across the rescuers lap as with the infant;
- If this is not possible, support the child in a forward leaning position;
- Deliver up to five sharp back blows with the heel of one hand in the middle of the back between the shoulder blades;
- Check to see if each back blow has relieved the airway obstruction.

**Chest thrusts**

If back blows fail to dislodge the object and the infant/child is still conscious use 5 chest thrusts.

**Method**

- To perform chest thrusts identify the same compression point as that for BLS;
- These are similar to chest compressions but sharper and delivered at a slower rate;
- In order to do chest thrusts you need to have the back of the patient supported.
- Check to see if each chest thrust has relieved the airway obstruction. The aim is to relieve the airway obstruction with each rather than give all 5 chest thrusts.

**In an infant**

- The infant should be in a head downwards supine position across the rescuer's thigh, or if too large to allow this then lay the baby across the rescuer's lap.

**In a child over 1 year of age**

- Children may be treated in the sitting or standing position

*If the obstruction is not relieved, continue alternating five back blows with five chest thrusts.*

**If the infant/child at any time becomes unconscious**

- Call for help
- Support the person carefully to the ground – do not place yourself in danger by 'catching the person'
- Place child supine on a flat surface
- Open the mouth and attempt to remove any visible object
- Open airway and attempt 2 breaths, reposition airway with each breath if the chest does not rise.
- Start chest compressions even if rescue breaths were ineffective.
- Continue the sequence for CPR ensure that the Code Blue team is on their way.
- After each breath attempts look in patient's mouth for the foreign body and remove if visible.
- If obstruction is relieved continue with CPR if no signs of life.

*If child breaths effectively then place in recovery position and continue to monitor condition.<sup>1</sup>*

## 4 References

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### Diagrams

All pictures are property of Sydney Children's Hospital except for the following

- Figure 1: Basic Life Support Flow Chart - Advanced Life Support Group (2011). Advanced Paediatric Life Support: the practical approach. (5th Ed.). Chichester: Wiley-Blackwell.
- Figure 6 : Recovery position. - American Heart Association (2005). American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Part 11: Paediatric Basic Life Support. Circulation, 112 (Supplement IV) 156-166. [http://circ.ahajournals.org/cgi/reprint/112/24\_suppl/IV-156] Accessed February 10th 2012.
- Figure 12: : Hand placement for 2 hand technique in compressions - Handley, A.J.; Koster, R.; Monsieurs, K; Perkins, G. D.; Davies, S.; Bossaert, L. (2005) 'European Resuscitation Council Guidelines for Resuscitation: Section 2. Adult Basic Life support and use of automated external defibrillators. Resuscitation, 67 (S1): S10. [http://www.erc.edu/index.php/guidelines\_download\_2005/en/] Accessed, March 5th 2012.
- Figure 15: Mouth to mouth and nose position in an infant - Advanced Life Support Group (2011). Advanced Paediatric Life Support: the practical approach. (5th Ed.). Chichester: Wiley-Blackwell.
- Figure 18: Foreign body airway obstruction sequence - Advanced Life Support Group (2011). Advanced Paediatric Life Support: the practical approach. (5th Ed.). Chichester: Wiley-Blackwell.

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## 5 Paediatric Basic Life Support Quiz Questions

The following Quiz is designed to assess the readers understanding of the guidelines outlined in this document. The quiz can be undertaken as a self-directed exercise or as part of a facilitated question and answer session with other learners.

**1. The causes of cardiorespiratory arrest in children are usually the result of:**

- cardiac arrhythmia
- hypoxia and hypovolemia
- snake bite
- coronary artery disease

(Need help? See: [Introduction](#))

**2. For the purpose of resuscitation the definition of an infant is a child under 1 year and a child is between one year and puberty?**

- True
- False

(Need help? See: [Definition of Terms](#))

**3. What are your first priorities when you find a collapsed child?**

- Give 2 rescue breaths
- Make a note of the time and run for help
- The DRSABCD approach
- Give chest compressions

(Need help? See: [Page 7](#))

**4. How do you assess responsiveness in an infant/ child?**

- Shake the infant/child vigorously and ask loudly "are you all right?"
- Gently grasp and squeeze the infant/child's shoulders and ask loudly "are you all right?"
- Check the infant/child's pupils and ask loudly "are you all right?"
- Take the infant/child's pulse and shout loudly "are you all right?"

(Need help? See: [Page 7](#))

**5. Which head position is recommended to ensure an infant has an open airway?**

- neutral position
- sniffing position
- flexed position
- Hyper-extended position

(Need help? See: [Page 8](#))



**6. You assess that the infant/child is not breathing, how many rescue breaths should initially be given?**

- 1 breath per second
- Up to 5 breaths to ensure 2 effective breaths
- 5 quick breaths
- 2 breaths

(Need help? [See: Page 10](#))

**7. How much breath/volume is recommended for each rescue breath?**

- As much breath/volume as possible
- There is no recommended breath/volume for a rescue breath
- Enough breath/volume to see the chest rise as normal

(Need help? See: [Page 10](#))

**8. If you were checking for a pulse in an infant what sites could you use?**

- either carotid or femoral arteries
- either femoral or brachial arteries
- either radial or carotid arteries
- either radial or femoral arteries

(Need help? [See: Page 11](#))

**9. How long should you assess for circulation?**

- 5 seconds
- 10 seconds
- 15 seconds
- 20 seconds

(Need help? [See: Page 11](#))

**10. Which of the following are indications to commence cardiac compressions in infants and children?**

- Unconscious and not breathing normally
- Slow pulse less than 60 per minute with poor perfusion
- No palpable pulse felt
- All of the above

(Need help? [See: Page 11](#))

**11. When locating the site for chest compressions in an infant/child it is recommended to compress over the lower half of the sternum.**

- True
- False

(Need help? [See: Page 11](#))

**12. When performing CPR on an infant/child the recommended ratio of breaths to compressions are?**

- 30 compressions: 1 breath
- 30 compressions :2 breaths
- 15 compressions: 2 breaths
- 15 compressions :1 breath

(Need help? [See: Page 13](#))

**13. If you are the sole rescuer performing cardiac compressions on an infant what technique is recommended?**

- the heel of one hand
- thumbs encircling the chest
- tips of 2 fingers
- 2 handed technique

(Need help? [See: Page 12](#))

**14. If you are performing cardiac compressions on a child what depth do you compress the chest?**

- Compress the chest approximately  $\frac{1}{3}$ <sup>rd</sup> depth of the chest
- Compress the chest approximately  $\frac{1}{2}$  depth of the chest
- Compress the chest approximately 1cm
- Compress the chest as far as possible

(Need help? [See: Page 12](#))

**15. How many compressions do you need to aim for to maximise cerebral perfusion?**

- 120 compressions per minute
- 100 compressions per minute
- 90 compressions per minute
- 80 compressions per minute

(Need help? [See: Page 13](#))

**16. It is recommended that CPR continue until:**

- The victim responds or starts breathing normally
- You notice gasping respirations
- You have completed 5 cycles of a ratio of 15:2 Compression:Ventilation
- After 1 minute of CPR you stop to reassess the victim

(Need help? [See: Page 14](#))

**17. Following CPR a child of 8yrs has return of spontaneous circulation but is not breathing spontaneously how many breaths/ minute do you aim for?**

- Approximately 30- 40 breaths per minute
- Approximately 20- 30 breaths per minute
- Approximately 12-20 breaths per minute
- Approximately 8-12 breaths per minute

(Need help? [See: Page 19](#))

**18. Why should a blind finger sweep technique to clear an airway never be used in infants and children?**

- It may cause tissue damage to the soft palate
- The child may bite you
- The child may have loose teeth
- It may cause the infant to cry

(Need help? [See: Page 9](#))

**19. What interventions are recommended for a child with suspected foreign body aspiration who has an ineffective cough?**

- the Heimlich manoeuvre
- CPR
- a series of back blows and chest thrusts
- Rescue breathing

(Need help? [See: Page 20](#))

**20. What information do you need to give when making an emergency call?**

- Emergency type (i.e. Code blue/Cardiac Arrest) Location of emergency
- Whether it is an adult or child
- All of the above

(Need help? [See: Page 7](#))

**21. What number do you call in your facility in the event of a Cardiac Arrest?**

\_\_\_\_\_

(Need help? [See: Page 7](#))