University of Glasgow

School of Medicine, Dentistry & Nursing

MB2 Basic Airway Management & Cardiopulmonary Resuscitation (CPR)

Learning Outcomes

By the end of the clinical skills session you should be able to:

- Demonstrate a safe approach and check patient's responsiveness
- Demonstrate checking for airway obstruction
- Demonstrate simultaneous airway opening, breathing and pulse check
- Demonstrate the location of the carotid pulse
- State the hospital emergency telephone number
- Demonstrate initiating and continuing chest compressions
- Demonstrate basic airway manoeuvers
- Demonstrate the use of simple airway adjuncts on a model
- Demonstrate the use of bag-valve-mask ventilation on a manikin
- Demonstrate two-person cardiopulmonary resuscitation

Introduction

Airway obstruction can happen for a number of reasons. Prompt assessment, ensure an open (patent) airway and ventilation if required are essential to avoid hypoxia. It is important to avoid hypoxia as this can result in brain damage and damage to other vital organs.

Causes of airway obstruction

Airway obstruction can be partial or complete. Figure 1 below demonstrates a sagittal view of an adult airway. Airway obstruction can occur at any point.

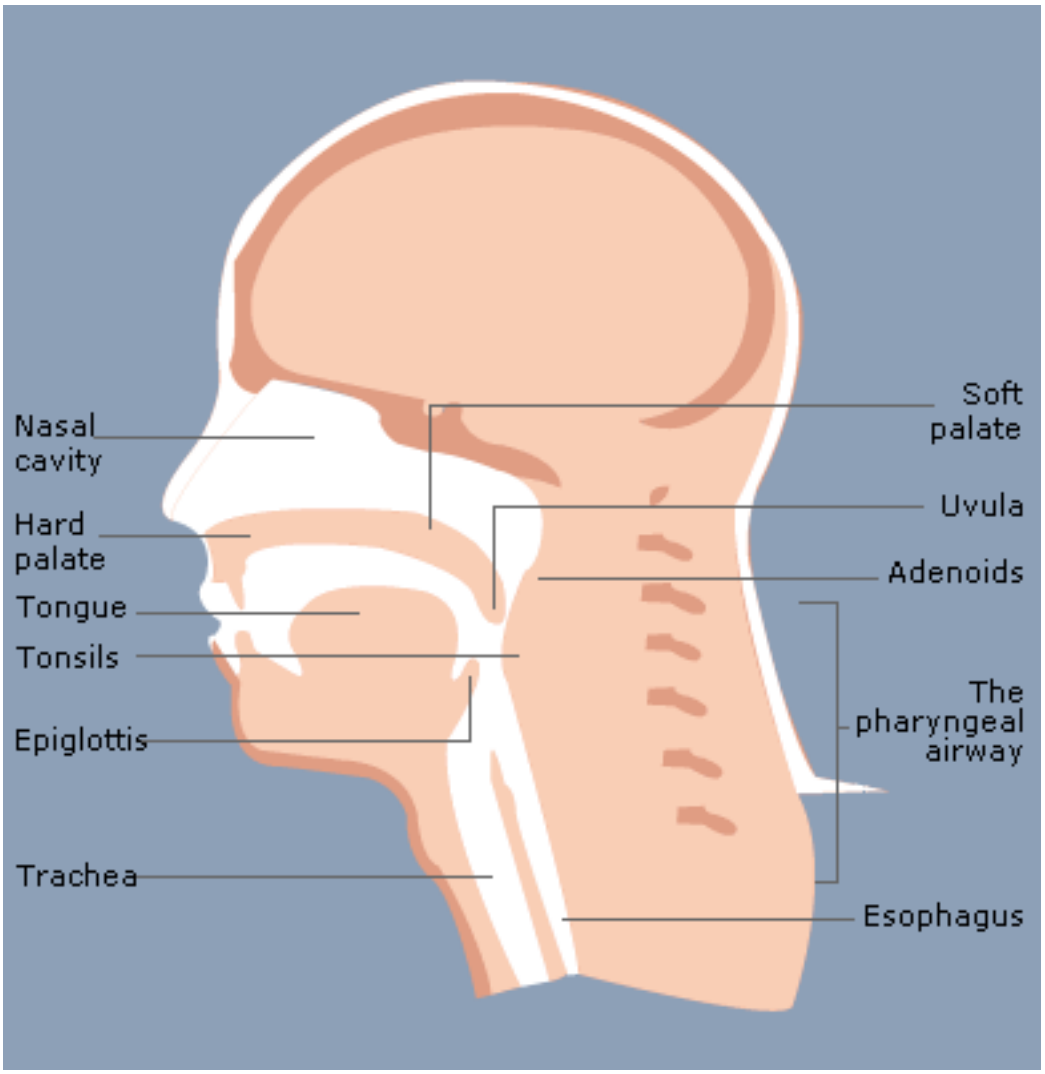

Fig 1: Adult airway

Causes of airway obstruction include:

- Vomit
- Blood
- Foreign bodies
- Anaphylaxis causing laryngeal oedema
- Trauma

The most common cause of airway obstruction in an unconscious patient is due to muscle relaxation causing their tongue to fall back against the soft palate, blocking their airway.

Signs of airway obstruction

In partial airway obstruction, air entry is reduced and often the patient will make abnormal noises, such as:

- Snoring, which happens when the pharynx is partially occluded by the tongue or palate
- Gurgling, if there are liquids or foreign bodies in the upper airway
- Stridor, an inspiratory noise caused by obstruction at or above the larynx
- Wheeze, an expiratory noise caused by lower airway obstruction (e.g. in acute asthma)

In total airway obstruction, there may be silence and absence of chest wall movement.

Recognition of airway obstruction

Recognition of airway obstruction can be achieved by LOOK, LISTEN and FEEL:

LOOK for chest movement

LISTEN and FEEL simultaneously for airflow at the mouth and nose

TOP TIP: If the patient is wearing an oxygen mask, look for evidence of fogging of the oxygen mask during expiration (See Figure 2).

Figure 2: Fogging of the oxygen face mask due to normal expiration

Basic Techniques for Opening the Airway

Basic Airway Manouevres

There are two basic airway maneouvres that you can perform to open up the patient's airway. These techniques do not require any additional equipment. They are:

- Head tilt chin-lift
- Jaw thrust

Head tilt chin-lift manoeuvre

(see Figure 4)

Place one hand on the patient's forehead and gently tilt their head back. Place the fingertips of your other hand under the point of the patient's chin, and gently lift. This manouevre stretches the anterior neck structures and allows the airway to open. Successful use of this manouevre should result in a reduction in abnormal airway sounds (see above section on signs of airway obstruction). High flow oxygen can then be applied if available.

Jaw thrust

(see Figure 3)

The jaw thrust lifts the mandible forwards, lifting the tongue off of the soft palate and epiglottis. Firstly identify the angle of the mandible. Using the fingertips of both hands, apply steady upwards and forwards pressure to lift the mandible. Successful use of this manouevre should result in a reduction in abnormal airway sounds (see above section on signs of airway obstruction). High flow oxygen can then be applied if available.

A jaw thrust is particularly effective when used in combination with bag valve mask ventilation. It is also the basic airway manouevre preferred if there is a history of suspected cervical spine injury.

Figure 3: Jaw thrust

Figure 4: Head tilt chin-lift

Other tips:

Suction

Use gentle suction under direct vision to remove any vomit, blood or secretions with a wide bore rigid sucker (Yankauer, see Figure 5 below). Only use the suction in the upper airway and where you can see the end of the sucker. If a patient has an intact gag reflect, suction can induce vomiting if used incorrectly.

Dentures

Leave well-fitting dentures in place as this helps to maintain the contours of the mouth, and will assist in achieving a good seal for bag-valve mask ventilation.

Figure 5: Yankauer wide bore suction tube which attaches to a suction unit

Simple Airway Adjuncts

Introduction

Simple airway maneouvres are helpful in relieving airway obstruction but maintaining these maneouvres for a long time is physically tiring. The maneouvres alone may also not be successful in relieving airway obstruction. There are two simple airway adjuncts that can be used:

- Nasopharyngeal airway (NP tube)
- Oropharyngeal airway (Guedel)

These are designed to address airway obstruction. In most patients, the oropharyngeal airway (in particular) produces the same result as a jaw thrust. Both adjuncts can be used with an oxygen mask.

Nasopharyngeal Airways

A nasopharyngeal airway is a tube made from soft plastic, with a bevel at one end and a flange at the other. In patients who are not deeply unconscious, this type of adjunct can be better tolerated. It is also useful in patients whose mouths are difficult to open, for example, during a seizure. Sizes 6-7mm are typical adult sizes.

NP airways can result in bleeding of the nasal muscosa, in up to 30% of cases. If the tube used is too long, it can caused laryngospasm or vomiting. In the case of known or suspected basal skull fracture, NP airways should not be used as there have been cases where the NP airway has gone through the fracture and entered the cranial vault.

Insertion Technique:

1. Lubricate the tube with gel
2. Insert the tube (bevel end) into the right nostril with eth curved side facing down
3. Aim gently towards the occiput, and with gentle twisting motions advance the airway
4. If firm resistance is met, try the next size down
5. Look for evidence of bleeding
6. Assess for improvement in airway patency

Figure 6: Nasopharyngeal airways

Oropharyngeal airway

The oropharyngeal airway (Commonly called a Guedel airway) is a curved plastic tube. It has a colour coded by size hardened plastic flange which sites between the patient's teeth. The most common sizes in adults are sizes 2 (green), 3 (orange) and 4 (red). These are for small, medium and large adults respectively. If the patient is in-between sizes, a slighter larger OP airway will be more beneficial than one which is too small.

Insertion Technique:

1. Size the OP airway between the patient's incisors and the angle of their jaw (as shown in Figures 7-8)

Fig 7: Measuring the size required between the incisors and angle of the jaw.

Fig 8: The flanged front end of the oropharyngeal airway should sit just in front of the teeth.

2. Insert the airway upside down (curve pointing upwards) as far as the junction between the hard and soft palate where you will feel some resistance
3. Rotate the airways 180 degrees and continue to advance the airway
4. Confirm the airway is positioned correctly by looking at the patient's incisors – the flanged front part of the airway should sit just in front of the teeth
5. Assess for improvement in airway patency

Adequate ventilation and oxygenation are required to prevent hypoxia. If the patient is breathing spontaneously, then apply oxygen to the patient's face using a Hudson face mask (see Figure 9) or a trauma mask (see Figure 10).

Figure 9: Hudson or standard face mask

Figure 10: Trauma mask with reservoir for high flow oxygen

If the patient is not breathing spontaneously by themselves, then mechanical ventilation can be provided using a bag valve mask (see Figure 11). This a mask with a self-inflating bag attached. When the bag is squeezed, the contents are delivered to the patient's lungs. On release, the expired gas is diverted into the atmosphere via a one way valve, and the bag automatically refills via an inlet at the opposite end. The bag valve masks should be attached to high flow oxygen if available.

Figure 11: Bag valve mask

It might look easy, but using this piece of equipment requires considerable skill! It is often difficult to maintain an adequate gas-tight seal between the mask and the patient's face, whilst maintaining a patent airway and squeezing the bag with the other.

For this reason, it is recommended that the ***two-person technique*** is used. One person holds the face mask in place utilizing a jaw thrust with both hands. The other person squeezes the bag. This allows a better seal to be maintained and therefore ventilation performed safely and effectively. The person who is squeezing the bag can also deliver chest compressions as part of cardiopulmonary resuscitation.

Bag valve mask ventilation technique (see Figure 12)

1. Use both hands simultaneously
2. Apply the mask firmly to the patient's face using your index finger and thumb in a capital C shape
3. Hook your little finger of both hands under the angle of the mandible and grip the mandible with both hands' ring and middle fingers
4. Pull upwards to perform a jaw thrust whilst holding onto the mask
5. Ask your assistant to squeeze the bag. Each squeeze is aiming for one third of the volume of the bag to be delivered over 1 second. This should provide a rise and fall of the patient's chest. Provide ventilation at a rate of 10-12 breaths per minute in a patient who has a pulse.

Figure 12: Two person bag mask valve ventilation technique

Cardiopulmonary Resuscitation

The algorithm for the initial management of in-hospital cardiac arrest is shown in Figure 13. You will be expected at this stage to deliver effective cardiopulmonary resuscitation as shown in the shaded area.

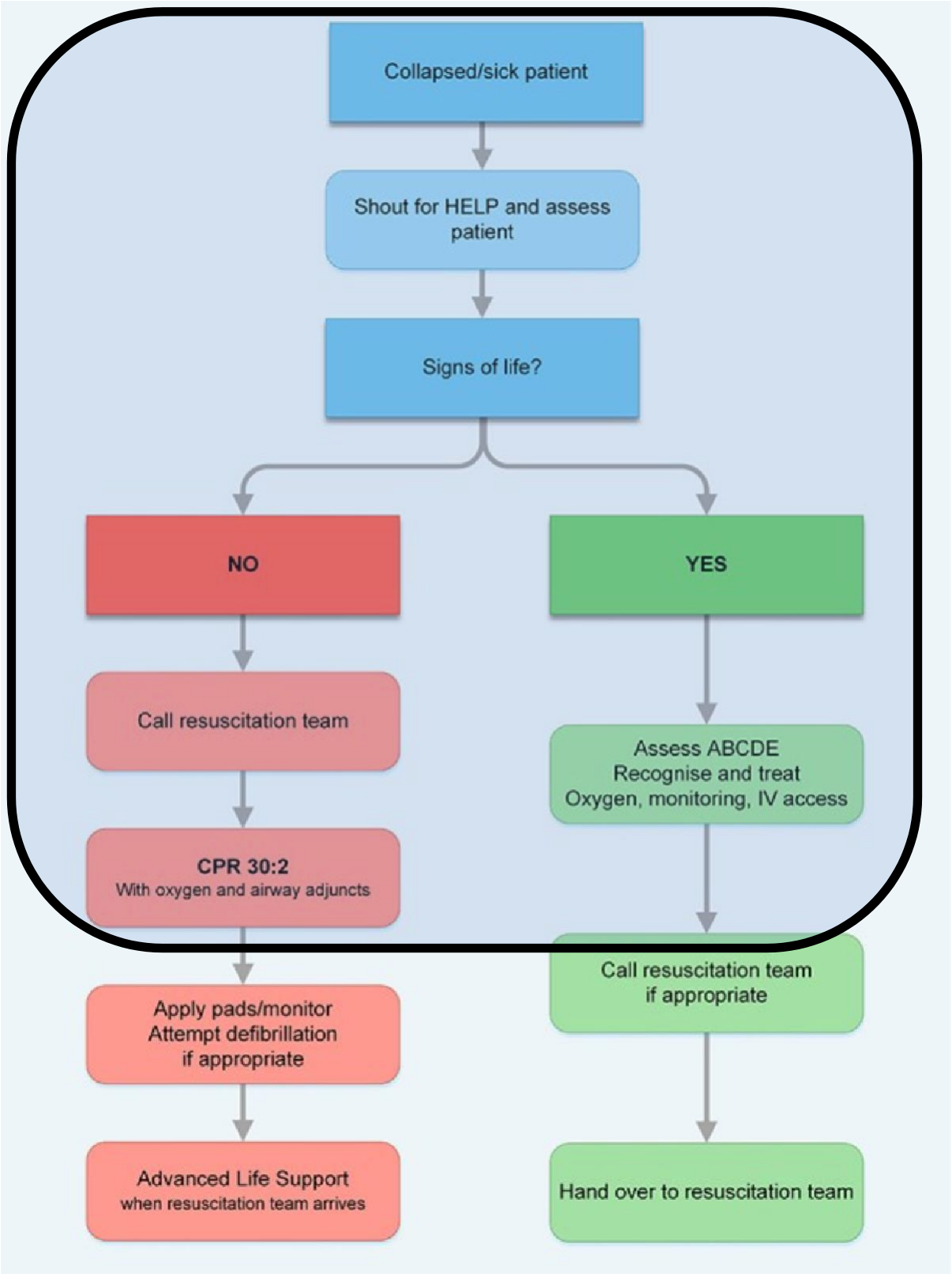

Figure 13: The In-Hospital Resuscitation Algorithm

Step 1 - Ensure personal safety

- Your personal safety and that of resuscitation team members is the first priority during any resuscitation attempt.
- Check that the patient's surroundings are safe.
- Put on gloves as soon as possible. Other personal protective equipment (PPE) (eye protection, face masks, aprons, gowns) may be necessary. Follow local infection control measures to minimise risks.
- Be careful with sharps! A sharps box must be available. Use safe handling techniques for moving patients during resuscitation.

Step 2 – Shout for help

- Out of hospital, shout for help from bystanders and call 999. Put your phone on loudspeaker and continue as below.
- In hospital, shout for help from nearby staff. Pull the emergency number. Dial 2222 which is the emergency number. State your location and ask for the cardiac arrest team.

Step 3 - Check the patient for a response

- If you see a patient collapse or find a patient unconscious, assess if they are responsive (shake and shout). Gently shake their shoulders and ask loudly: "Are you all right?" into both ears.

A - If the patient responds:

- Urgent medical assessment is required. Call for help according to local protocols.
- Give the patient oxygen. Use a pulse oximeter to guide oxygen therapy.
- Attach monitoring: a minimum of pulse oximetry, cardiac monitoring and blood pressure.
- Prepare to handover the patient when help arrives using SBAR (Situation, Background, Assessment, Recommendation)

B - If the patient does not respond:

- Shout for help (if not done already).
- Turn the patient on to their back.
- Open the airway using head tilt chin lift manoeuver.
- Keeping the airway open, look, listen, and feel to determine if the patient is breathing normally. This is a rapid check and should take less than 10 seconds:
    - Look for chest wall movement
    - Listen at the patient's mouth for breath sounds
    - Feel for air on your cheek
- Assess the carotid pulse simultaneously whilst checking for breathing. The assessment should take less than 10 seconds whether you do a pulse check or not (see Figure 14 below for a demonstration of the correct positioning).

Figure 14: Screenshot from the RC (UK) Cardiac Arrest Management Demo demonstrating the simultaneous pulse and breathing check

C - If the patient is breathing with a pulse

- Urgent medical assessment is required. Depending on the local protocols, this may take the form of a resuscitation team.
- Follow the steps in 3A above whilst waiting for the team and equipment to arrive.
- The patient is at high risk of further deterioration and cardiac arrest and needs continued observation until help arrives.

If there are no signs of life, and there is no respiratory effort or pulse (cardiorespiratory arrest):

- Start chest compressions
- Ask a helper to call the resuscitation team / 999 (if not already done so)
- If alone, leave the patient to get help and equipment, and return as quickly as possible
- Chest compressions in a patient whose heart is still beating are unlikely to cause harm. However, delays in diagnosing cardiac arrest and starting CPR will adversely affect chances of survival and must be avoided, so if there is any doubt proceed as if there are no signs of life and no pulse.
- Give 30 chest compressions followed by 2 breaths via a bag valve mask.
- The correct hand position for chest compression is the middle of the lower half of the sternum (see Figure 15)
- This hand position can be found quickly by placing the heel of one hand in the centre of the chest with the other hand on top
- Ensure high quality chest compressions:
    - Depth of 5–6 cm
    - Rate of 100–120 compressions min
    - Allow the chest to recoil completely after each compression
    - Take approximately the same amount of time for compression and relaxation
    - Minimise any interruptions to chest compression (hands-off time)

Figure 15: Correct hand position for effective chest compressions

- If there are enough team members, the person doing chest compressions should change out every 2 min or sooner if they are unable to maintain high quality chest compressions. This change should be done with minimal interruption to compressions.
- Use whatever equipment is available immediately for airway and ventilation (e.g. a bag valve mask) and add supplemental oxygen as soon as possible.
- Use an inspiratory time of about 1 second and give enough volume to produce a visible rise of the chest wall. Avoid rapid or forceful breaths.

If the patient is not breathing and has a pulse (respiratory arrest)

- Ventilate the patient's lungs (as described above) and check for a pulse every 10 breaths (about every minute).
- This diagnosis can be made only if you are confident in assessing breathing and pulse or the patient has other signs of life (e.g. warm and well-perfused, normal capillary refill).
- If there are any doubts about the presence of a pulse, start chest compressions and continue ventilations until more experienced help arrives. All patients in respiratory arrest will develop cardiac arrest if the respiratory arrest is not treated rapidly and effectively.

Note:

Mouth-to-mouth ventilation is not used in clinical settings, due to the risk of passing on infection. There may be non-clinical situations where giving mouth-to-mouth breaths could be life-saving (e.g. in drowning). If no ventilation equipment is immediately available, it is recommended that you perform chest compressions continuously until help or airway equipment arrives. A bag valve mask should be immediately available in all clinical areas.