Chapter 3A
ADULT RESCUSCITATION

Learning Objectives:

By the end of this session, the participants will be competent in:

- Providing basic life support
- Providing advanced cardiac life support
- Rhythm recognition in ACLS

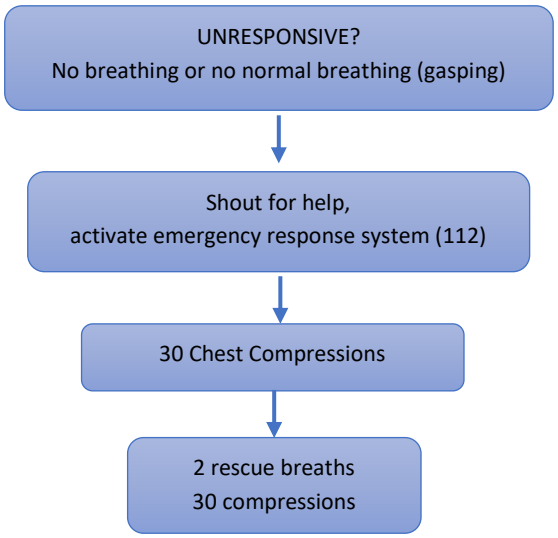
INTRODUCTION

A cardiac arrest is the ultimate medical emergency. Good quality cardiopulmonary resuscitation (CPR) improves a victim's chance of survival following a cardiac or respiratory arrest.

ADULT BASIC LIFE SUPPORT (BLS)

Basic Life Support refers to maintaining airway patency and supporting breathing and the circulation.

Adult Basic Life Support Algorithm:



CPR Sequence

❖ **Assessment**

The rescuer arriving at the side of the victim should **make sure that the scene is safe** and then check the victim for a response. Tap the victim on the shoulder or gently shake the victim and shout, "Are you all right?" Check for breathing or abnormal breathing (gasping) and a simultaneous pulse check of less than 10 seconds.

❖ **Shout for help**

If you are alone and find an unresponsive victim, shout for help/ activate emergency response team.

❖ **Start Chest compression**

Start 30 chest compressions followed by opening the airway with a head tilt-chin lift maneuver and 2 effective breaths (1 cycle). 5 cycles ~ 2 minutes. **C-A-B**. Circulation-Airway-Breathing except for neonates and known asphyxial arrests.

❖ **Reassess**

Recheck the victim after 2 mins or 5 cycles of CPR. Continue CPR if no signs of spontaneous breathing and heartbeat.

Table 3A.1 Specific Role of Rescuer During CPR

Rescuer	Location	Action

1	At the victim's side	• Perform chest compression, • Count out loud, • Switches roles with 2nd rescuer every 5 cycles/2 minutes
2	At the victim's head	• Maintains an open airway, • Gives breaths watching for chest rise and avoiding hyperventilation

If a third rescuer is present, he/she can help with bag mask ventilation and also rotate into position to give compressions. A team approach is recommended. **Stop CPR** if Return of spontaneous circulation (ROSC) is achieved. Then proceed to secondary assessment.

Important points to remember:

Move the victim only when necessary.

Do not move the victim while CPR is in progress unless the victim is in dangerous environment (such as a burning building) or if you cannot perform CPR effectively because of the victim's present position or location.

Compression–ventilation ratio:

Use a compression-ventilation ratio of 30 compressions to 2 breaths when giving CPR.

Positioning the victim:

The victim should be in a face up (supine) position and on a hard surface before you begin CPR. If the victim is not in a face up position, roll the victim on his back (face up) taking care of the spines. If the victim is not on a hard surface, place a rigid board between the victim and bed or move the victim to the floor.

Compression only CPR:

Studies have shown that this may be effective only in the first few minutes (less than 5 min) after non-asphyxial arrest. Recommended for untrained rescuers reluctant to ventilate victim.

Continue resuscitation:

Until qualified help arrives and takes over, the victim starts to show signs of life (ROSC), OR until You become exhausted.

Recovery position:

Keep resuscitated victims in the recovery position. Should be adopted for unconscious patients who have achieved ROSC to prevent airway obstruction and aspiration. If the victim has to be kept in the recovery position for more than 30 min turn him/her to the opposite side to relieve the pressure on the lower arm.

Table 3A.2 Overview of CPR

Recommendations	
Component	Adults
Recognition	Unresponsive. No breathing or no normal breathing (gasping)
	No pulse palpated within 10 seconds for all ages
CPR sequence	C-A-B
Compression rate	100-120/min
Compression depth	At least 2 inches (5 cm) or 1/3 of AP diameter of the patient's chest
Hand position	Compressor's hands should be on the center of the patient's chest, 2 inches above xiphi sternum
Chest wall recoil	Allow complete recoil between compressions.

	Rotate compressors every 2 minutes
Compression interruptions	Minimize interruptions in chest compressions Attempt to limit interruptions to <10 seconds
Airway	Head tilt–chin lift (if suspected neck trauma: use only jaw thrust)
Compression: ventilation ratio until advanced airway placed	30:2 for 1 or 2 rescuers
Ventilations: when rescuer untrained or reluctant (not preferred)	Compressions only
Ventilations with advanced airway	1 breath every 6-8 seconds (8-10 breaths/min) Asynchronous with chest compressions About 1 second per breath Visible chest rises
Defibrillation	Attach and use AED as soon as available. Minimize interruptions in chest compressions before and after shock; resume CPR beginning with compressions immediately after each shock.

Clinical Skills:

Pulse Check-

- Check for carotid pulse in the neck taking at least 5 sec but not > 10 sec
- Maintain a head tilt with one hand on the victim's forehead.
- Locate the trachea, using 2 or 3 fingers of the other hand.
- Slide the fingers into the groove between the trachea and the muscles at the side of the neck.

Chest Compression-

- Position yourself at the victim's side.
- Make sure the victim is lying on his back on a firm, flat surface. If the victim is lying face down, carefully roll him onto his back taking care of C-pine.
- Put the heel of one hand on the center of the victim's chest (which is the lower half of the victim's sternum). If in doubt of hand position, remove clothing covering the victim's chest.
- Put the heel of your other hand on top of the first hand.
- Interlock the fingers of your hands and ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or the bottom end of the sternum.
- Position yourself vertically above the victim's chest and with your arms straight, press down on the

Figure 3A.1 Place the hand on the center of the victim's chest (lower half of the victim's sternum)

sternum at least 2 (5 cm) or 1/3 of AP diameter of the patient's chest.

Push hard and fast-

- Compression and release should take an equal amount of time. Deliver compression at a regular rate of 100-120 per minute.
- At the end of each compression, make sure that you allow the chest to recoil or re-expand completely (without losing contact between your hands and sternum). Full chest recoil allows more blood to refill the heart between compressions, while incomplete chest recoil will prevent the heart from refilling completely.

Opening the airways and giving breaths-

- Position yourself at the victim's side so that you are
- ready to open the airway and ready to give breaths to the victim
- open with head tilt-chin lift or jaw-thrust technique

Figure 3A.2 Head tilt-chin lift technique

Head tilt-chin lift

- Place one hand on the victim's forehead and push with your palm to tilt the head back.
- Place the fingers of the other hand under the bony part of the lower jaw near the chin.
- Lift the jaw to bring the chin forward.

Caution: *Do not press into the soft tissue under the chin because this might obstruct the airway. If cervical injury is suspected, use jaw thrust.*

Figure 3A.3 Jaw thrust technique.

Jaw thrust-

Place one hand on each side of the victim's head and grasp the angles of the lower jaw and lift with both hands, displacing the mandible forwards.

- Jaw thrust without a head tilt is safest for opening the airway in victims with suspected cervical injury.

Mouth to mouth rescue breathing-

- Hold the victim's airway open with head tilt-chin lift maneuver.
- Pinch the victim's nose with your thumb and index finger, using the hand on the forehead.
- Take a deep breath and seal your lips around the victim's mouth creating an airtight seal and give 1 breath (blow for 1 second) and observe for the chest to rise.
- Give second breath and observe for chest rise.
- If chest does not rise after blowing air into the victim's mouth, **reposition** the head.

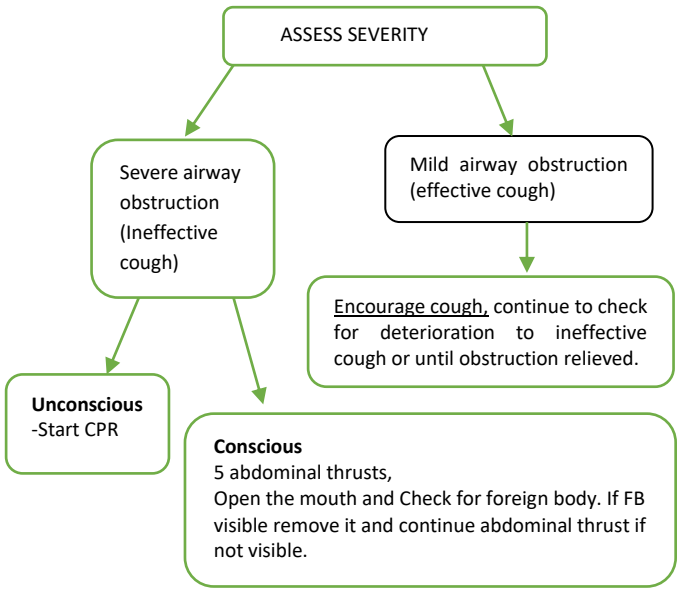
Caution: *Blowing into the victim's mouth with too much force may cause the air to enter the stomach rather than the lungs. This can cause gastric inflation, leading to regurgitation and aspiration of gastric contents.*

Figure 3A. ix: Manual in line stabilization of neck for victims with suspected cervical spine injuries.

ADULT CHOKING

Foreign bodies may cause either mild or severe obstruction. Recognition of choking (airway obstruction by a foreign body) is the key to successful outcome.

Adult Choking Treatment Algorithm



Abdominal Thrusts

- Stand behind the victim and put both arms round the upper part of his abdomen.
- Lean the victim forwards.
- Clench your fist and place it between the umbilicus and the bottom end of the sternum.
- Grasp this hand with your other hand and pull sharply in wards and upwards. Repeat up to five times.
- Perform chest thrust for pregnant or obese victim.

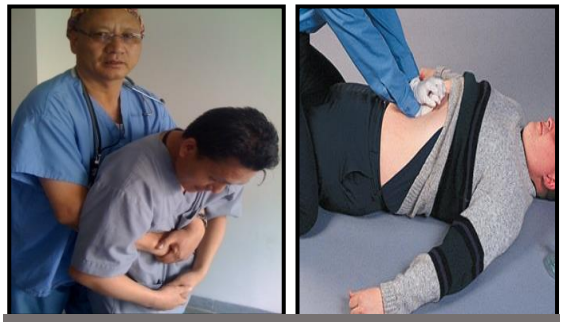


Figure 3A.4 Abdominal thrust for conscious and unconscious patient.

ADULT ADVANCED CARDIAC LIFE SUPPORT (ACLS)

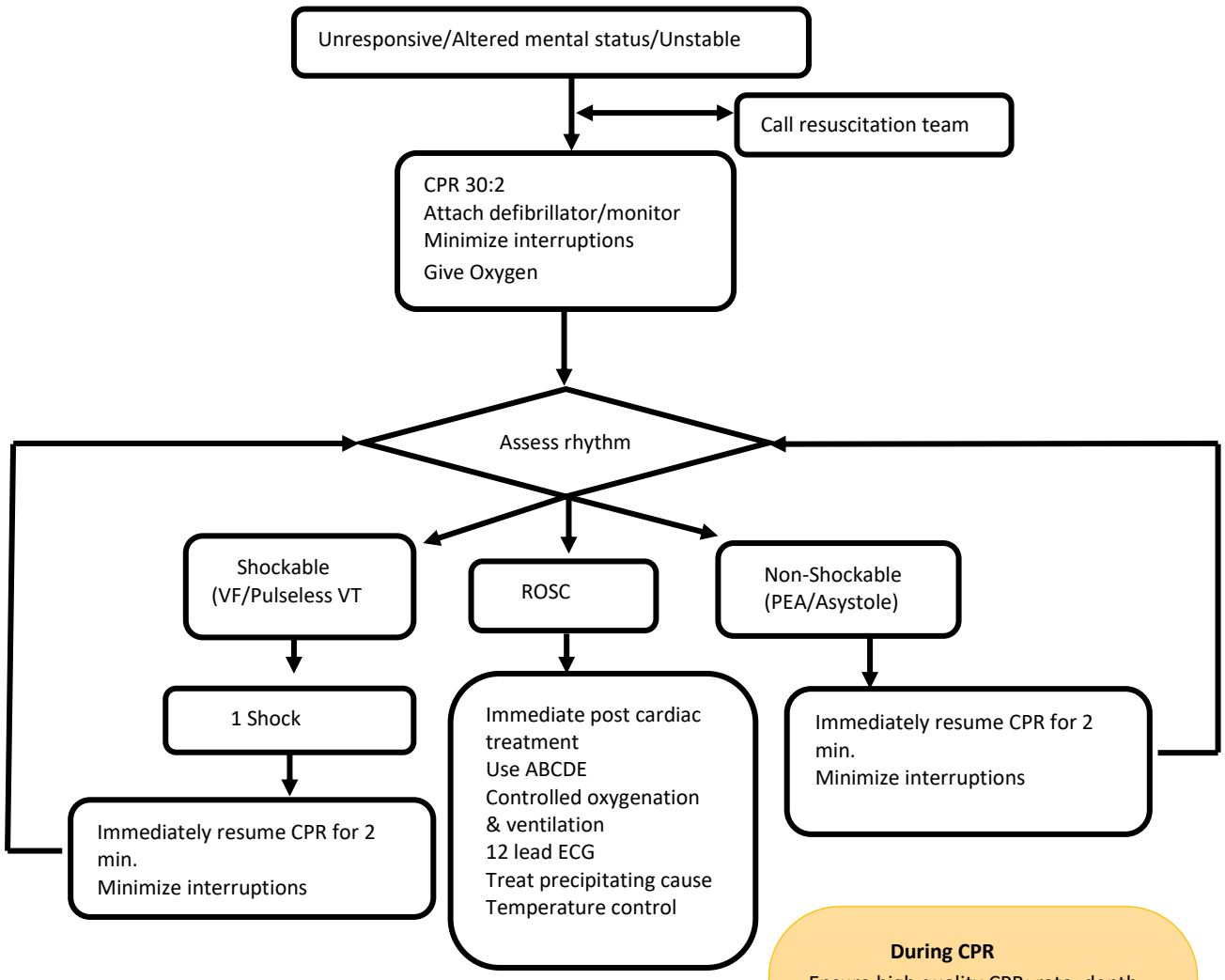
CPR started immediately (within 3 minutes) using adjuncts and if indicated, defibrillation, improves a victim's chances of survival.

ACLS Sequence:

- Confirm cardiac arrest – check for signs of life or breathing and pulse simultaneously.
- Call resuscitation team.
- Initiate CPR 30:2.
- Perform uninterrupted chest compressions while applying self-adhesive defibrillation/ monitoring pads – one below the right clavicle and the other in the V6 position in the mid-axillary line.
- Plan actions before pausing CPR for rhythm analysis and communicate these to the team.

- Stop chest compressions; confirm rhythm from the ECG.

ACLS Algorithm



Reversible causes

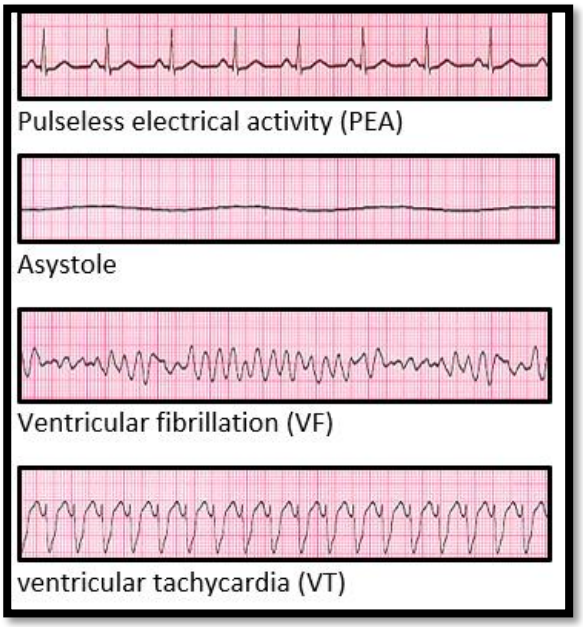
Hypoxia
Hypovolemia
Hypo-/hyperkalemia/metabolic
Hypothermia
Thrombosis- coronary or pulmonary
Tamponade- cardiac
Toxins
Tension pneumothorax

During CPR

Ensure high quality CPR: rate, depth, recoil
Plan actions before interrupting CPR
Give oxygen
Consider advanced airway & capnography
Continuous chest compressions when advanced airway in place
Vascular access (intravenous/intraosseous)
Give adrenaline every 3-5 min
Correct reversible causes

CARDIAC ARREST ARRHYTHMIAS

Treatment of Shockable Rhythms (VF and pulseless VT):



- Resume chest compressions immediately; simultaneously, the designated person selects the appropriate energy on the defibrillator (200J biphasic /360 J monophasic) and press the charge button.
- While the defibrillator is charging, warn all rescuers other than the individual performing the chest compressions to "stand clear".
- Remove any oxygen delivery device as appropriate (1meter away/ventilation bag may also be left connected to tracheal tube in intubated patient).
- Once the defibrillator is charged, tell the rescuer doing the chest compressions to "**stand clear**"; when clear, give the shock. Position for defibrillator paddles same as for pads.
- Without reassessing the rhythm or feeling for a pulse, restart CPR using a ratio of 30:2, starting with chest compressions.
- Continue CPR for 2 min; the team leader prepares the team for the next pause in CPR.
- secure IV line(s)
- **Pause briefly to check the monitor.**
- If VF/pVT, deliver a **second shock** and continue CPR.
- If VF/pVT persists, deliver a **third shock**.
- Resume chest compressions immediately and then give adrenaline 1 mg IV and amiodarone 300 mg IV while performing a further 2 min CPR. (Alternative – preservative free lignocaine 1mg/kg - do not give if amiodarone already given).
- Repeat 2 min CPR, rhythm/pulse check, and defibrillation sequence if VF/pVT still persists.
- Give further adrenaline 1 mg IV after alternate shocks (i.e., approximately every 3-5 min).
- For refractory VF/pVT, a further dose of amiodarone 150mg followed by 900mg over 24 hrs. may be given.
- If organized electrical activity compatible with a cardiac output is seen during a rhythm check, seek evidence of return of spontaneous circulation (ROSC).
- Check a central pulse and end-tidal CO_2 trace if available.
- If ROSC achieved, start post-resuscitation care.
- If no signs of ROSC, continue CPR.
- If asystole, continue CPR and switch to the non-shockable algorithm.

Caution:

- *Avoid hyperventilation-it may worsen the outcome of cardiac arrest. It can reduce venous return to the heart and reduce blood flow during chest compression.*
- *Delivery of drugs via a tracheal tube is no longer recommended.*
- *Do not interrupt CPR to give drugs. Flush drugs with 20 ml NS.*

Treatment of Non-Shockable Rhythms (PEA and Asystole):

- Resume CPR 30:2

- Give adrenaline 1 mg as soon as intravascular access is achieved
- Continue CPR 30:2 until the airway is secured, then continue chest compressions without pausing during ventilation
- Consider possible reversible causes and correct any that are identified
- Recheck the patient after 2 min: If there is still no pulse and no change in the ECG appearance, continue CPR.
- Recheck the patient after 2 min and proceed accordingly.
- Give further adrenaline 1 mg every 3-5 min (alternate loops).
- If VF/VT, change to the shockable rhythm algorithm.
- If a pulse is present, start post-resuscitation care.

Caution:

- *For asystole, without stopping CPR, check that the leads are correctly placed.*
- *Atropine is no longer recommended for routine use in asystole or PEA.*

Clinical Skills:

Basic Airway Maneuvers and Airway Adjuncts-

Assess the airway. Use head tilt and chin lift, or jaw thrust to open the airway. Simple airway adjuncts (oropharyngeal or nasopharyngeal airways) are often helpful, and it is essential to maintain an open airway.

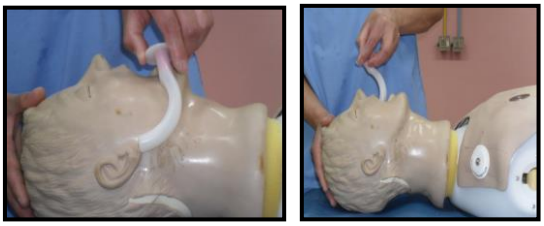


Figure 3A.5 Selecting a correct sized airway and inserting an oropharyngeal airway.

Bag-valve mask ventilation-

Single person technique:

- The mask is held against the face by downward pressure on the mask body exerted by the left thumb & index finger (C shaped).
- The middle, ring finger grasp the mandible to facilitate extension of the atlanto-occipital joint while little finger is placed under the angle of the jaw & used to thrust the jaw anteriorly forming E shape (E-C technique)
- The other hand is used to ventilate.

Two-person technique: Preferred in difficult situations- the thumbs can hold the mask down & the fingers or knuckles displace the jaw forwards.

Figure 3A.6 one-person bag-mask ventilation.

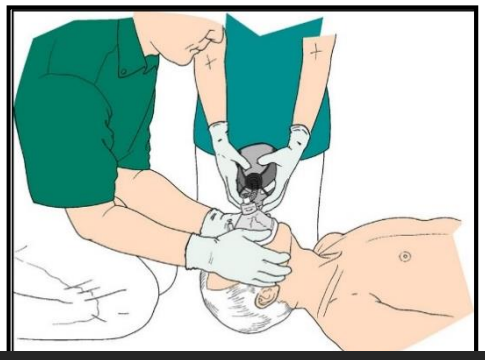


Figure 3A.7 two-person bag-mask. ventilation.

Endotracheal Intubation-

Preparation:

- Check the suction & suction catheter.
- Check the oxygen cylinder.

- Check the bag-valve mask.
- Check the intubation tray: different size functioning laryngoscopes, different size tubes, a 10 ml syringe, stylet, different size airways and if available an LMA (laryngeal mask airway) & a gum elastic boogie.
- Drugs- for intubation and resuscitation.

Tube sizes:
Males: 7.5-8 mm internal diameter.
Females: 7-7.5 mm internal diameter.

Depth:
Roughly diameter times 3 cm (less in short neck patients).

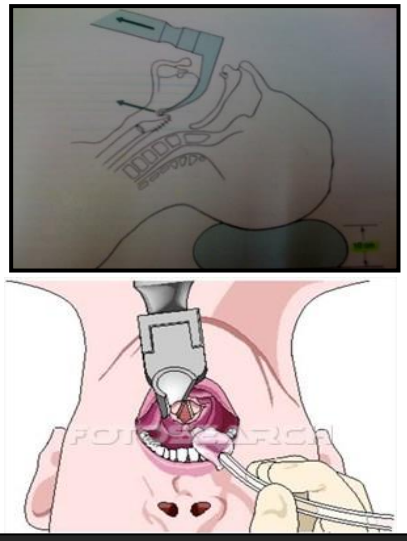


Figure 3A.8 Laryngoscopy & intubation.

Intubation Steps

- Pre-oxygenate with 100% oxygen for 3 minutes.
- If BP maintained – give IV Sodium Thiopentone 3-5mg/kg.
- BP low – give Ketamine 1-2 mg/kg to render patient unconscious.
- If required & ventilation possible, give IV Succinylcholine 1-2 mg/kg. Onset within 30 sec. (Contra-indication: hyperkalemia, burn, paralyzed patients).
- Head tilt extending the atlanto-occipital joint, open the mouth with your right hand.
- With your left hand introduce the laryngoscopy blade into the right side of the oropharynx sweeping the tongue to the left & up into the floor of the pharynx.
- The tip of the curved blade is inserted into the vallecula while the straight blade covers the epiglottis.
- Insert Endotracheal tube (ETT) with your right hand.

Confirmation of ETT placement

- Direct visualization of tube entering the vocal cords.
- Observation of chest expansion bilaterally.
- Auscultation over the lung fields bilaterally in the axillae (breath sounds should be equal and heard clearly) and over the epigastrium (breath sounds should not be heard).
- Secondary confirmation: End tidal CO2.

Caution:
- *Provide artificial ventilation as soon as possible in any patient in whom spontaneous ventilation is inadequate or absent (rescuer's expired oxygen concentration is only 16-17%).*
- *No intubation attempt should interrupt chest compressions for more than 10 s; if intubation is not achievable within this time, recommence bag-mask ventilation.*
- *In victims with suspected cervical injury, do not extend the neck:*
- *use in-line- stabilization of neck during intubation as shown in figure 3A.i.*
- *Once a tracheal tube has been inserted, ventilate the lungs at a rate of about 10 breaths per min and continue chest compression without pausing during ventilation.*

ALTERNATIVE AIRWAY DEVICES

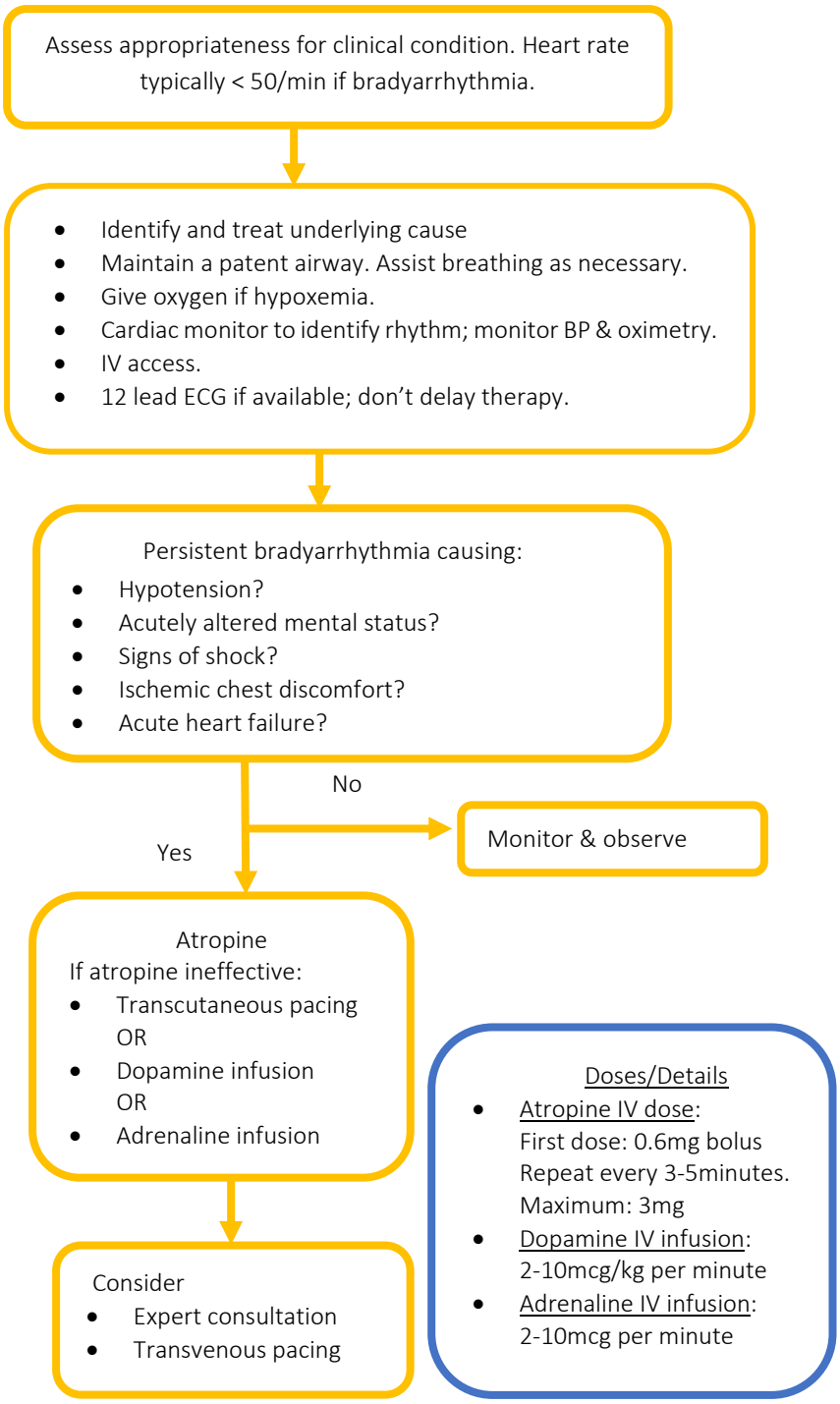
- LMA (laryngeal mask airways)

- Combi tube
- Needle/surgical cricothyroidotomy

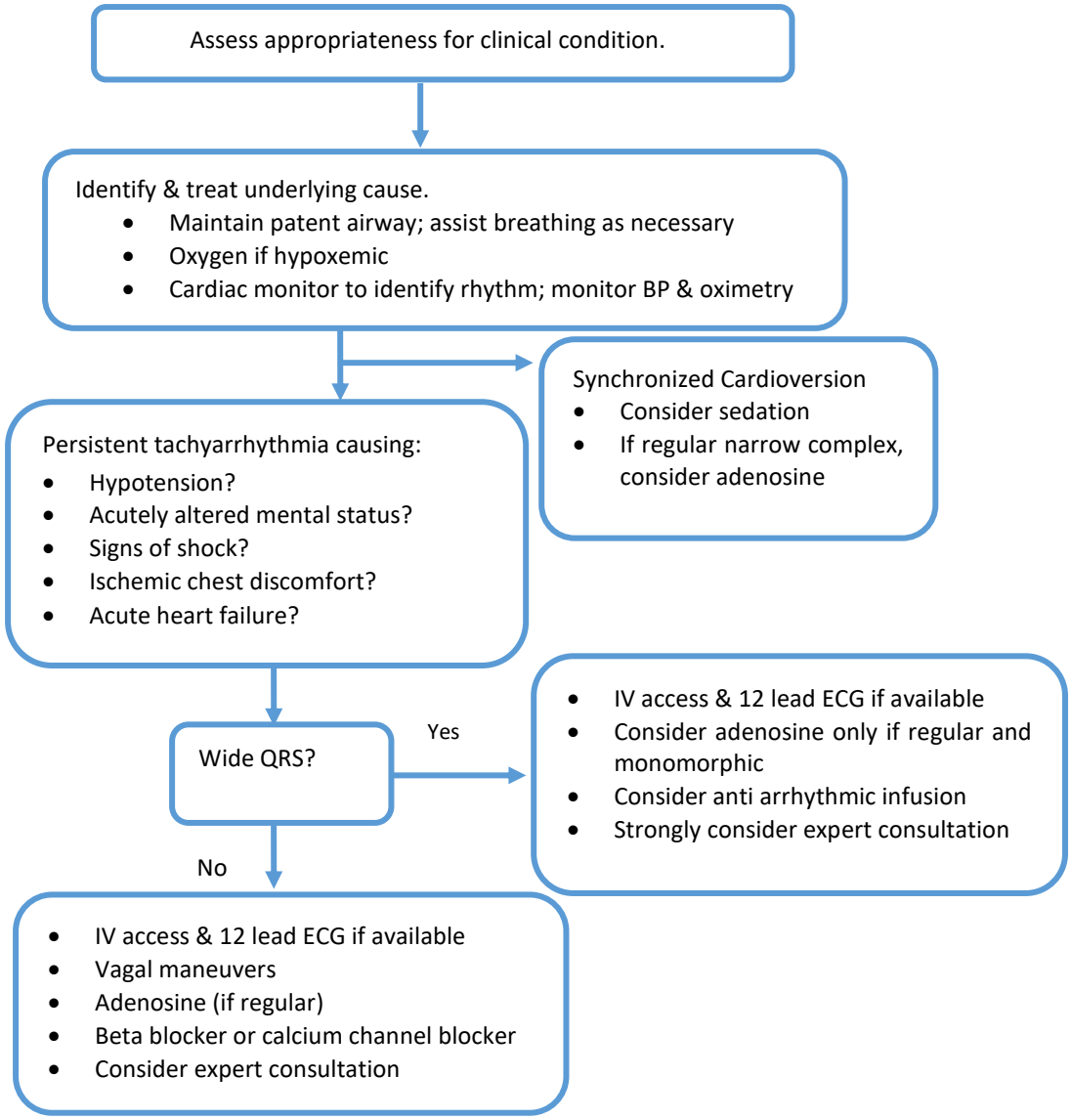
POST RESUSCITATION CARE

- Resuscitated patients should be transferred to an intensive care unit. The post-cardiac-arrest syndrome comprises of post-cardiac-arrest brain injury, myocardial dysfunction, the systemic ischemia/reperfusion response, and persistence of precipitating pathology.
- Airway & Breathing- Hypoxemia and hypercarbia both increase the likelihood of a further cardiac arrest and may contribute to secondary brain injury. Post-resuscitation hypoxemia was associated with worse outcome, compared with both normoxemia and hypoxemia.
- Circulation- BP & arrhythmia control.
- Disability- Control of seizures.
- Glucose control-Blood glucose values > 180 mg/dl should be treated with insulin and hypoglycemia avoided.
- Temperature control-Intensive monitoring & reassessment.
- Simultaneous treatment of underlying cause.

ADULT BRADYCARDIA (With Pulse)



ADULT TACHYCARDIA (With Pulse)



Doses/ details:

Synchronized Cardioversion- Initial recommended doses:

- Narrow regular: 50-100 J; Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J; Wide irregular: Defibrillation dose- NOT synchronized.

Adenosine IV dose:

- First dose: 6 mg rapid IV push; follow with NS flush; Second dose: 12 mg if required

Antiarrhythmic infusions for stable wide QRS tachycardia

- Procainamide IV dose: 20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases > 50% or maximum dose 17 mg/kg given. Avoid if prolonged QT or CHF
- Amiodarone IV dose: First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1mg/min for first 6 hrs.
- Sotalol IV dose: 100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.