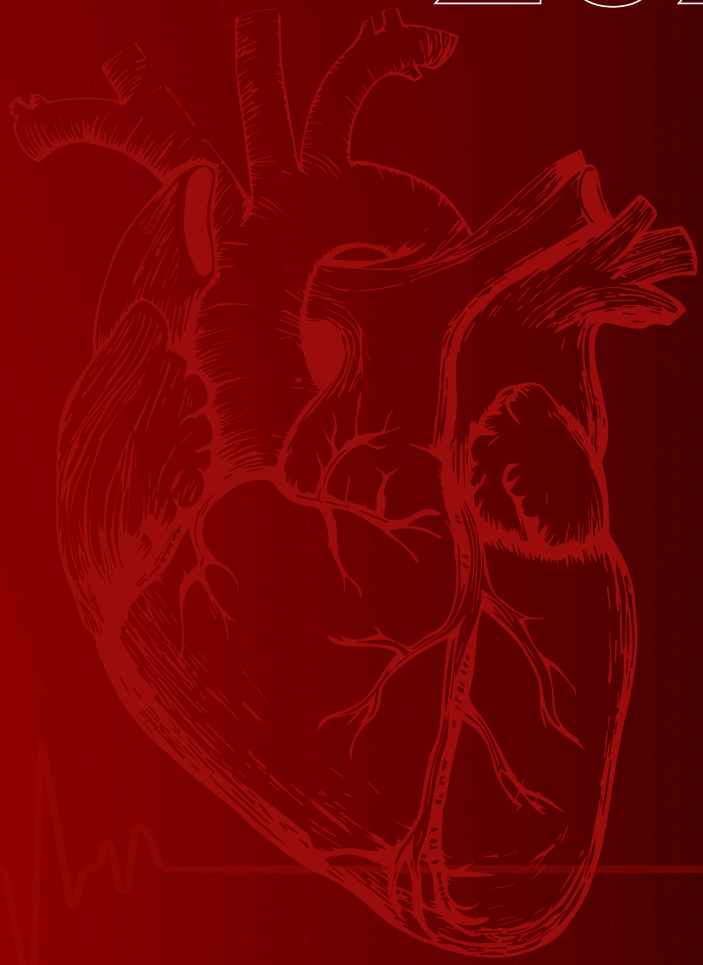
جمعية القلب السعودية
Saudi Heart Association
National Life Support Committee

ACLS

SHA Advanced Cardiac Life Support Provider Manual

2024

SHA ACLS PROVIDER MANUAL



جمعية القلب السعودية

Saudi Heart Association

Saudi Heart Association
Advanced Cardiac Life Support
Provider Course

SHA ACLS provider course

Preface

This course is intended for all healthcare professionals who are involved in the care of critically or seriously ill adults including physicians, general practitioners, anesthetists, paramedics, respiratory therapists, nurses, and medical students. This course is composed of ten chapters, for each chapter, the learning objectives are specified and the most important elements are reviewed. The content of this material is dedicated for the SHA ACLS course, it is a summary of the latest evidence in the literature.
For further details, you can refer to the references indicated in the last chapter

Acknowledgements

The Saudi Heart Association would like to acknowledge the Clinical Skills and Simulation Center at King Saud University Medical City and their staff for their cooperation and support during the development of the content ofthis course to enhance the simulation technologies and teaching methods incorporated in this course.

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CHAPTER 1

COURSE INTRODUCTION AND OVERVIEW

Chapter 1

Course Introduction and Overview

Course Objectives

The Saudi Advanced Cardiac Life Support provider course is for healthcare intended professionals who work with severely sick adults who are experiencing respiratory and/or cardiovascular problems, as well as cardiopulmonary arrest. To improve recognition and intervention for respiratory emergencies, shock, and cardiopulmonary arrest; precourse preparation, case based discussion, and active participation in skill stations and simulated cases will be used.

Goal of the Saudi Advanced Cardiac Life Support provider course

The Saudi Advanced Cardiac Life Support provider course aims to enhance adult patient outcomes by training healthcare personnel to recognize and manage adult patients who are experiencing respiratory crises, shock, or cardiopulmonary arrest.

Learning Objectives

After finishing this course, the students will be able to:

• Recognize cardiac arrest and begins high-quality CPR as soon as possible, according to Saudi Heart Association (SHA) advanced cardiovascular life support (ACLS) guidelines.

• Recognize the difference between respiratory distress and failure and begin treatment as soon as possible.

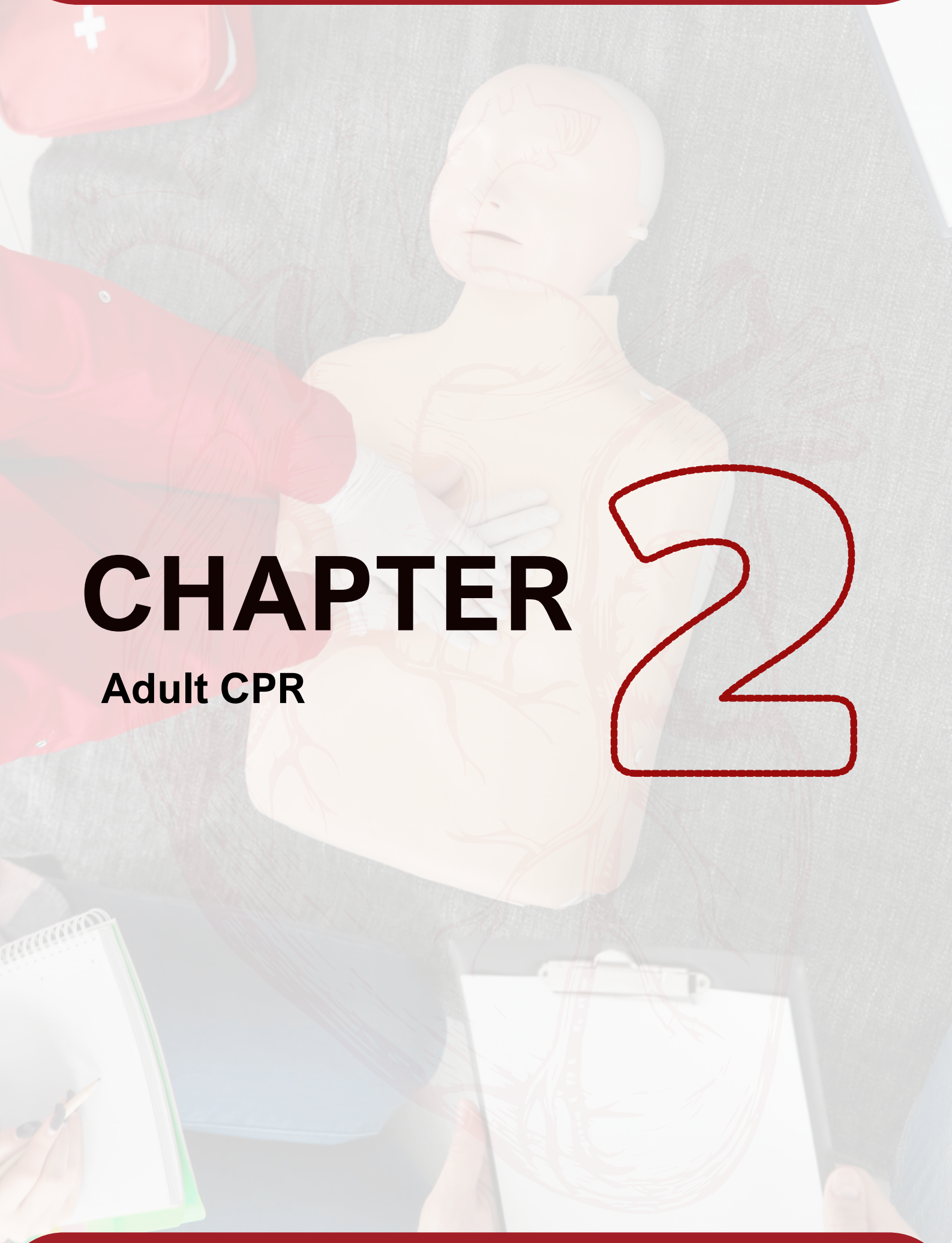
• Differentiate between unstable and stable arrhythmia patients and begin treatment as soon as possible.

• Assess, initiate, and lead cardiac arrest and post-cardiac arrest management a

Course Description

To help you achieve these objectives, the Saudi ACLS Provider Course includes

• Pre-course textbook
• Case based discussion
• Case scenario test stations
• Online Exam
• Skills station
• Simulation sessions with debriefing
• End of course evaluation



CHAPTER 2

Adult CPR

Chapter 2

Adult CPR

Learning objectives:

At the end of this chapter you will be able to learn:

• Recognize the signs of cardiac arrest in adults

• How to Perform effective chest compression for adults as single rescuer and two rescuers

• Explain how to open the airway for adults in different technique

• How to provide breaths by using pocket mask for adult • Describe the importance of early use of an AED and how to operate it.

Single Rescuer Adult CPR

In this part you will learn how to perform high quality CPR when there is a single or multiple rescuers, we will start to discuss CPR skills for a single rescuer.

Once the rescuer notices that there is someone collapse immediately should do assessment.

• Assessment:

i. Assess the surrounding environment

• by looking if there is any dangerous situation around the victim, quickly move the victim to a safe place without any harm for the rescuer, for example, if the victim is beside fire, try to move the victim to a safer place. If the place is safe, do not try to move the victim as he/she may have other injuries that you cannot see. Simply put him onto his back over a firm surface and start to assess the victim

ii. Assess the Victim by taping at his shoulder and talk to him loudly, if not responding.

Figure 2.1 check responsiveness

Figure 2.2 check carotid pulse

iii. Call for help or EMS system by calling 997 0r 911 and ask to bring AED

iv. Assess pulse and Breathing for at least 5 seconds but not more 10 seconds

v. Assess the carotid pulse for adults by sliding 2 or 3 fingers into the groove between the trachea and the neck muscles at the side of the neck and look for the chest movement (rise and fall).

Figure 2.2 check carotid pulse

vi. If there is pulse and breathing, put the victim in a recovery position with continuous monitoring for signs of airway occlusion, inadequate or agonal breathing and unresponsiveness. but if the recovery position is a factor impairing the rescuer provider's ability to determine the presence or absence of signs of life, the person should be immediately positioned supine and re-assessed. The recovery position put the victim in lateral recumbent positioning with the arm nearest the first aid provider at right angle to the body and elbow bent with palm up and far knee flexed.

Figure 2.3 Recovery position

vii. if there is no pulse and breathing (or agonal gasp) Activate Emergency response system by activate the hospital cod or call 911/997 if the victim out hospital and start high quality CPR

viii. if there is pulse without normal breathing activate the rapid response team if the victim inside the hospital or call 911/ 997 if out the hospital, then start rescue breathing (chapter 10) and assess the pulse every 2 minutes

2. High quality CPR (cardiopulmonary resuscitation)

Components of CPR:

- **C: compressions**
- **A: airway**
- **B: breathing**

Chest Compressions for Adults

Chest compressions are the most important component of high quality CPR, during cardiac arrest, the heart stops pumping oxygenated blood to the brain and vital organs, and can cause irreversible damage in minutes.

Chest compression helps in blood flow out of the heart to reach brain and vital organs through arteries, and When pressure on the chest is released, blood is allowed to return to the heart, which may help in minimizing the damage and to stimulate the normal activity of the heart.

Agonal gasps

Agonal gasps are a sign of cardiac arrest which are uncontrollable, inadequate breathing patterns brought on by hypoxia, or low blood oxygen levels. It is probable that someone is dying since this breathing is abnormal. Due to the fight for oxygen, agonal breaths may be accompanied by some trembling or other muscular action. It sounds like heavy breathing and snoring, or inaudible

Figure 2.4 Checking pulse and breathing simultaneously

To perform the compression in effective and correct way follow these steps for performing CPR compressions:

1. Put the victim on his or her back on a firm surface like floor or backboard
2. Kneel at the victim's side.
3. Place the lower palm (heel) of one hand over the center of the victim chest, between the two nipples.
4. Place your other hand on top of the first hand and interlace your fingers.
5. Keep your elbows straight and position your shoulders directly above your hands in a straight line.
6. Push straight down on compress) the chest at least 2 inches at least 2 inches (5 centimeters) but no more than 2.4 inches (6 centimeters), push by using your body weight.
7. Push fast at a rate of 100 to 120 compressions per minute
8. Allow the chest to recoil (return the chest to normal position) in between compressions. If you do not allow the chest to recoil, the heart will not fill completely, because less blood will be pumped out of the heart to brain and vital organs with the next compression.
9. Rescuer should start CPR within 10 seconds from recognizing cardiac arrest and try to minimize chest compression interruption when finish 30 compressions (in 15-18 second) to give 2 breaths to less than 10 second to improve survival rate.

Figure 2.5 Chest compression at depths 2 inches at least (5 cm)

Airway: Open the airway

After performing 30 chest compressions, open the person's airway by using the head-tilt chin-lift maneuver by putting your palm on the person's forehead and gently tilt the head back. Then with the other hand, lift the chin forward to open the airway.

Figure 2.6 Head tilt chin lift maneuver

Jaw thrust is performed if there are suspected head injuries. It is performed by putting the index and middle fingers to push the posterior part of lower jaw upwards while thumbs push down on the chin to open the mouth.

Figure 2.7 Jaw thrust maneuver

Breathing

In one-rescuer CPR, breaths should be provided by using a pocket mask, if available. Pocket masks provide a barrier between the rescuer and the victim. Some masks are equipped with a one-way valve that allows the rescuer's breaths to enter the victim's airway, but prevents the victim's expired air from entering the rescuer's airway.

To provide breaths by using Pocket mask

1. Positioning yourself at the victim's side will allow you to provide ventilations and compressions without moving from the victim's side.
2. Put the mask on the victim's face. Masks are usually triangular in shape, and you will notice that the mask's narrow end should be over the bridge of the victim's nose.

Figure 2.8 Correct placement of pocket mask against victim face

3. Seal the mask against the victim's face. To do this, take the hand that is closest to the top of the victim's head and place it along the edge of the mask with the thumb of your other hand, apply pressure along the bottom edge of the mask. Then place the remaining fingers of your second hand along the bony edge of the jaw and lift the jaw upwards. Open the airway by performing a head-tilt chin-lift procedure. While you lift the jaw, ensure that you are sealing the mask all the way around the outside edge of the mask to obtain a good seal against the victim's face.

Figure 2.9 Pocket mask sealing

4. Deliver air over 1 second, ensuring that the victim's chest rises but avoiding hyperventilation.

- If the victim's chest does not rise, reposition the mask and try to get a better seal, open the airway and give the second breath, observe chest rises, then resume 30 compressions in less than 10 seconds.
- If the chest doesn't rise after a second breath, Resume 30 chest compression repeats the cycles of 30 compressions and 2 breaths for 5 times which is equal to 2 minutes then reassess pulse and breathing.

Figure 2.10 Breath delivery over one second and observe chest rise

3. Automated external defibrillator (AED)

- AED is a device that recognizes ventricular fibrillation and other dysrhythmias and delivers an electric shock, even there is different brands of AED but steps to use the same, and safe for anyone to use, as soon as an AED is available, turn it on and follow the voice prompts.
- AED steps

1. Open the case and turn on the AED

Figure 2.11 Turn on AED

2. Remove all clothing covering the chest. If necessary, wipe the chest if wet.
3. Open the AED adult pads which is used for age 8 years and above.

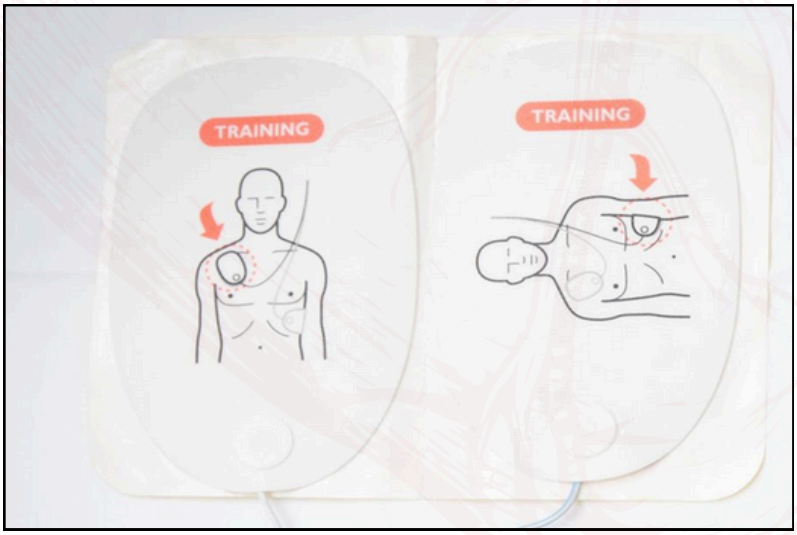


Figure 2.12 AED Adult pads

4. Place one pad on the upper right side of the chest and Place the other pad on the lower left side of the chest, a few inches below the left armpit.

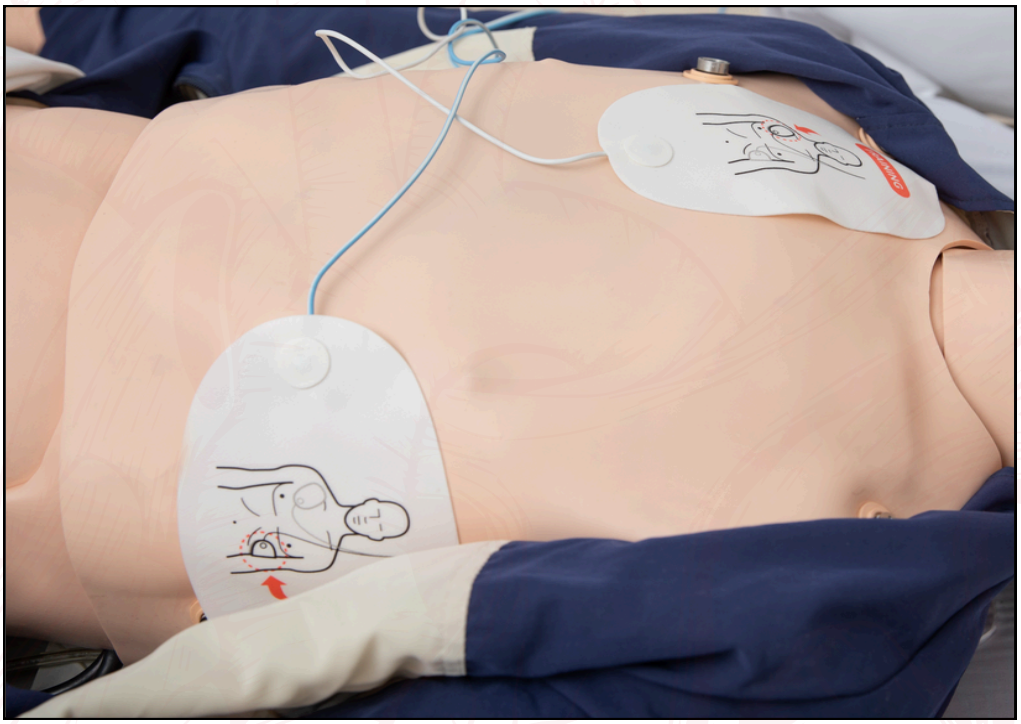


Figure 2.13 AED Pads Placement

5. Plug the pad connector cable into the AED.

Figure 2.14 Plug in AED Cables Placement

6. Make sure no one is touching the person to let AED analyze the heart rhythm.
7. Say, “CLEAR!” in a loud voice.

Figure 2.15 Clear the victim verbally

8. If shocked advised
   - Make sure no one is touching the person
   - Say, “CLEAR!” in a loud voice
   - Push the “shock” button to deliver the shock

Figure 2.16 Push the shock button

9. After the AED delivers the shock, or if no shock is advised, immediately start CPR, beginning with compressions.

Special Situation for AED

- The victim has a hairy chest: use a razor to shave the areas covered by the AED pads. If a razor is not available, quickly pull off the pads to remove enough hair to allow a new set of pads to adhere to the victim's skin and press it to ensure good contact with skin.
- The victim is submerged in water: first pull the victim to a dry area, quickly dry the chest and use the AED.
- The victim has an implanted pacemaker: You will recognize it as a small lump under the skin on the chest, usually the upper chest. avoid placing the AED pad directly over it; pacemaker stimuli may degrade the accuracy of ECG rhythm analysis or the pacemaker may be damaged by defibrillator discharges; doing so may block delivery of the shock.
- The victim has a medication patch: Do not place an AED pad over the patch. If it won't delay delivery of a shock, remove the patch and wipe the skin before applying the AED pad.

Two Rescuer Adult CPR

- **First rescuer** assesses the safety of the surrounding and kneel at the victim side victim assess response, activate emergency response system, remove any clothes on the chest Place his hand on the chest as we explain before and begin CPR, start with chest compression and continue cycles of chest compressions and ventilation with face mask until second rescuer returns with AED and bag mask device
- **Second rescuer** give AED for the first rescuer and kneel in the opposite side of first rescuer to take over chest compression to maintain the quality of CPR
- **First rescuer begins** to use the AED like what was explained before in the AED part. After shock delivered or no shock advised, immediately continue high quality CPR starting with chest compression by the second rescuer and the first rescuer will move to be at the victim's head to deliver breaths by using a bag mask device.

Breathing

- In two rescuer CPR, breaths should be provided by using a bag mask ventilation.
- Bag mask device is a self-inflating bag attached with a face mask and oxygen reservoir; some devices include a nonrebreathing valve. It provides 21% oxygen from room air and 100% oxygen if connecting the opposite end of the bag to an oxygen source.
- It provides positive pressure ventilation by handling it manually against the face and nose and squeezing the bag ventilates the patient through the nose and mouth.

Figure 2.17 Bag Mask

To provide breaths by using bag mask device

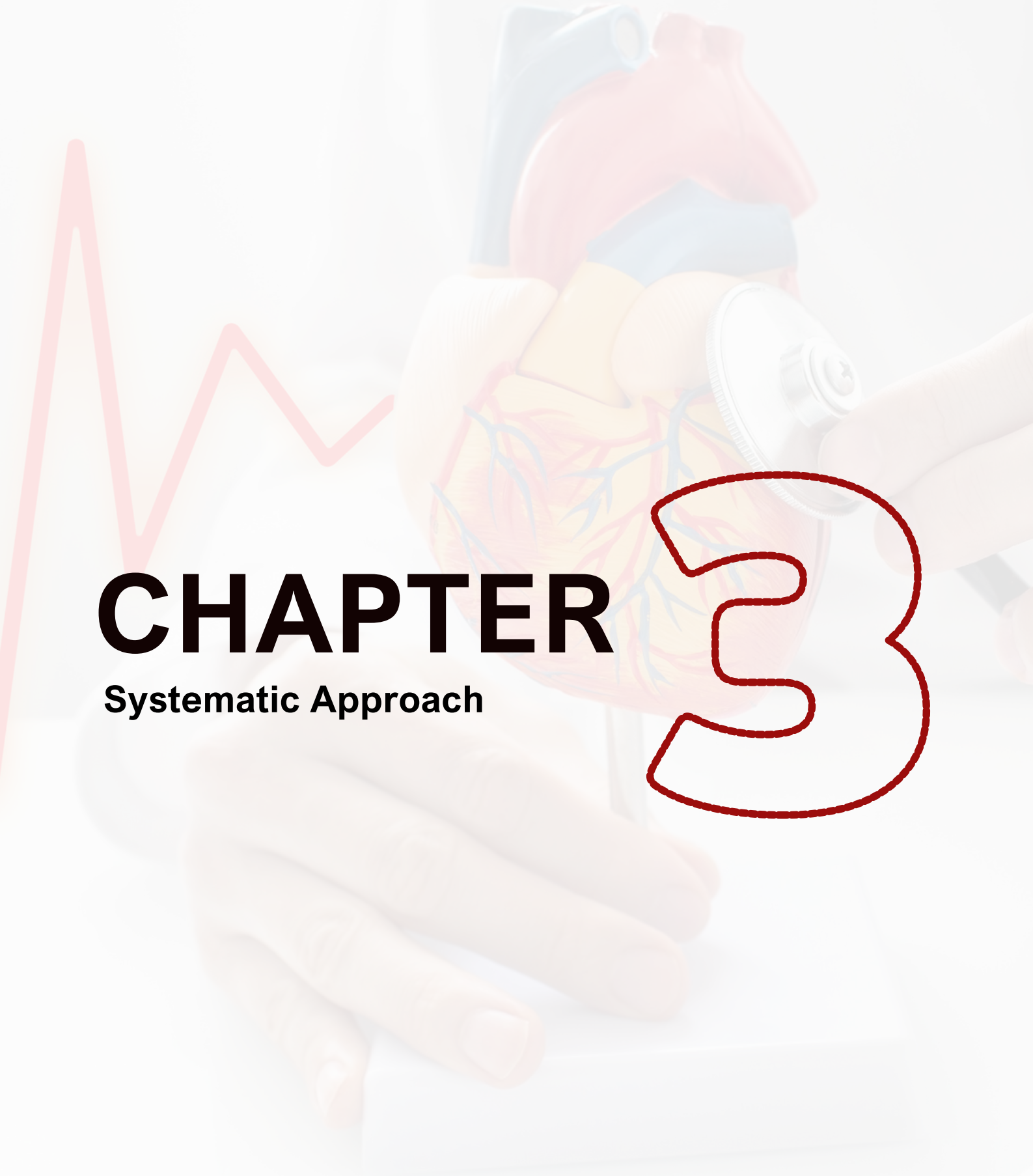
1. Second rescuer will be positioning himself at the victim's head
2. Cover victim mouth and nose with the appropriate mask size
3. Seal the face mask by placing fingers of one hand like EC-shape across the top and bottom edge of the mask and open the airway using the head-tilt/chin-lift maneuver.
4. Deliver the first breath by squeezing the bag over one second, just enough to see the chest rise to avoid hyperventilation.

Figure 2.18 Squeezing the bag just enough to see chest rise

5. Observe the chest rise, if there is chest rise give another breath over one second.
6. If the victim's chest does not rise, reposition the mask and try to get a better seal, open the airway and give the second breath, after 2 breaths, the first rescuer will continue 30 compression

Figure 2.19 Chest compression and ventilation ratio (30:2)

- Rescuers should switch positions if fatigued or every 2 minutes (5 cycles), when AED starts analyzing the victim heart rhythm which happens automatically after 2 minutes that's why it's important to keep AED pads on the victim chest not to remove it.
- Rescuers positions switching very important to maintain high quality not to stop CPR until hospital code arrive if in hospital or EMS if out hospital victim



CHAPTER 3

Systematic Approach

CHAPTER 3
SYSTEMATIC APPROACH

Learning Objectives:

At the end of this chapter, the students will be able to

- Learn the importance of using the rapid patient assessment tool
- Identify the difference between the BLS and ACLS survey
- Recognize life-threatening conditions and how to provide critical interventions

Systematic Approach

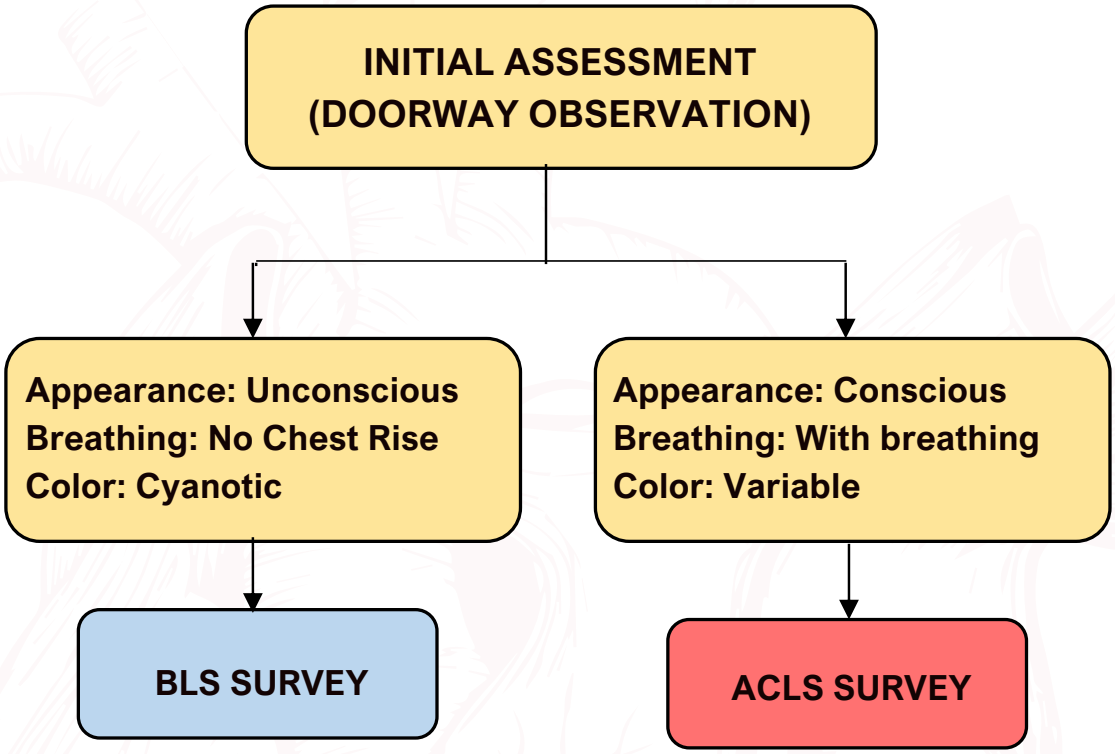
Resuscitation should be in a goal-oriented approach in order to achieve a consistent and optimum result of survival. In advanced life support, the immediate goal is to achieve a return of spontaneous circulation while the most important goal is to obtain adequate cerebral and coronary perfusion pressure.

Healthcare providers must ensure that survivors have intact neurological function through proper oxygenation and ventilation as well as maintaining circulation. Two systematic ways to achieve these goals are Basic Life Support (BLS) and ACLS surveys in which High-quality CPR, early defibrillation, and high-performance teams are emphasized. As you start the survey, make sure that the scene is safe.

While approaching the patient, begin with your doorway observation or initial assessment

If the patient appears to be **unconscious: Follow the BLS Survey**

If the patient appears to be conscious: **Follow the ACLS survey**



BLS Survey Steps

Table 3.1 BLS Survey

1. Check response: Tap the shoulder and ask “Are you ok? “
2. Call the emergency response system and ask or get an AED.
3. Check the pulse and breathing simultaneously for (5-10 sec) In the absence of a pulse, start high-quality CPR with 30 chest compressions and 2 breaths. Pulse is present but not breathing, give rescue breathing at 1 breath every 6 seconds
4. Defibrillation/AED (Use as early as possible). Shockable rhythm, deliver shock promptly and safely then resume CPR. Not shockable, continue high-quality CPR

Table 3.2 Primary Assessment (ABCDE)

ASSESSMENT	MANAGEMENT
AIRWAY	
Check for patency • Observe any audible abnormal breath sounds that might indicate an airway obstruction. • Can the patient keep his airway open? • Is there an indication of an advanced airway?	• Position the head properly to open the airway by using head tilt and chin lift or jaw thrust. • Suction for no more than 10 seconds if indicated. • Use airway adjuncts if indicated • Insert advanced airway if indicated
BREATHING	
Is oxygenation and ventilation adequate? • Connect the patient to a pulse oximeter • Assess respiratory rate (RR) • Chest rise • Lung sounds	• Provide supplemental oxygen • Perform Bag mask ventilation
CIRCULATION	
Check central and peripheral pulses. • Attach to monitor and Analyze rhythm with pulse rate. • Measure the blood pressure. • Check capillary refill time.	• Obtain IV/IO cannulation • Administer volume resuscitation if indicated. • Administer blood volume if indicated. • Draw labs (blood sample). • Give appropriate medication if indicated. • Start compressions if indicated
DISABILITY	
Check neurological function • Is the patient alert (A), response to verbal stimuli (V), response to painful stimuli (P), or unresponsive (U) (AVPU). • Glucose level. • Pupil reaction	
EXPOSURE	
Expose to check for signs of • Trauma • Bleeding • Burn • Previous surgeries • Medical bracelets • Medications patches • Needle use • Skin rashes • Assess Temperature	Manage any abnormal findings

1 SAMPLE

Table 3.3 Secondary Assessment

S	Signs and Symptoms Objective and subjective data
A	Allergies Food, mold, grass, dust
M	Medications name of the drug, dose
P	Past medical history Previous hospitalization, family health history, any chronic disease, existing illness
L	Last meal consumed
E	Events led or prior to the signs and symptoms.

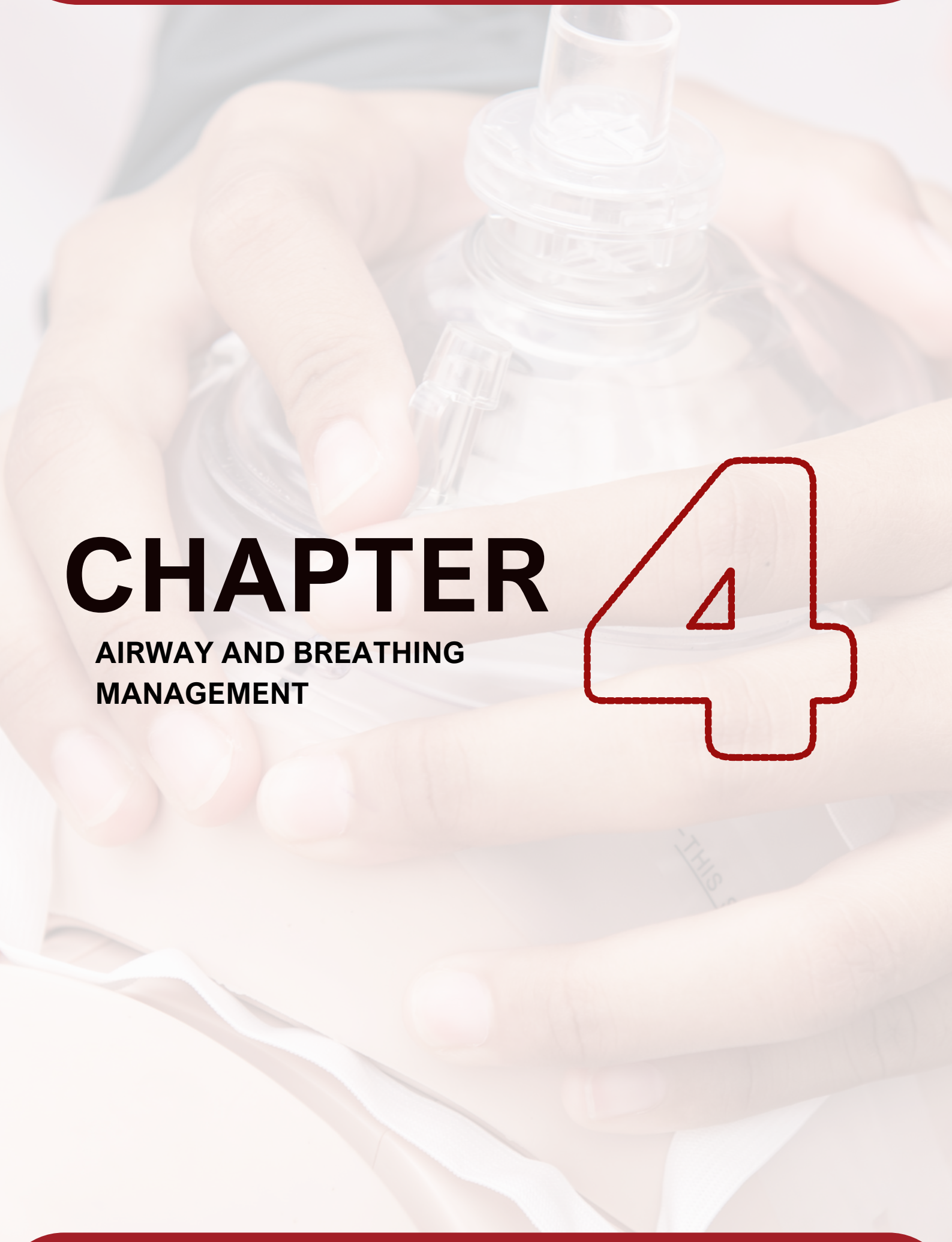
H's and T's

Table 3.4 Differential Diagnosis

H'S	Related Risk factors/Cause	Signs and Symptoms	Evaluation	Management
Hypoxia low level of O2 in the body tissues	History of Chronic Heart and Lung Condition	• DOB • Rapid heart rate • Confusion • Restlessness • Cyanotic	• Pulse oximeter • ABG • Chest X-ray • CT scan	• Patent airway • Supplemental O2 • BVM ventilation • Advanced Airway
Hypovolemia	• Vomiting • Diarrhea • Dehydration • Internal bleeding • Trauma • Blood loss • Burn	• Dizziness • Weakness • Fatigue • Increase thirst	• Urine test • CBC • Chemistry • Liver and Kidney Function, • X-ray, • Ct scan or MRI	• IV Fluid • Blood Transfusion

H'S	Related Risk factors/Cause	Signs and Symptoms	Evaluation	Management
Hypothermia	• Exposure to cold weather or immersion to cold water • Very old and young patients' drug and alcohol intoxication	• Shivering • Slurred speech • Slow shallow breathing • Drowsiness • Feeling tired • Confusion • Memory loss	• Measure temperature	• Warm fluid
Hypovolemia	• Vomiting • Diarrhea • Dehydration • Internal bleeding • Trauma • Blood loss • Burn	• Dizziness • Weakness • Fatigue • Increase thirst	• Urine test • CBC • Chemistry • Liver and Kidney Function, • X-ray, • Ct scan or MRI	• IV Fluid • Blood Transfusion
Hydrogen Ion (acidosis): Low pH, low bicarbonate Level, and normal PaCO2	• Renal failure • DKA • Drug overdose with Tricyclic Antidepressants, Aspirin, Cocaine, or Diphenhydramine	• Rapid breathing • Nausea & vomiting • Confusion • Dizziness. • Fatigue • Weakness • Loss of appetite. • Headache	• ABG • VBG • Kidney function • Lactic acid test. Urine PH	• IV Sodium Bicarbonate
Hyperkalemia-High Potassium Level	• Chronic Renal Failure • DKA • Diabetes with Hyperglycemia • Recent Dialysis, • On ACE inhibitors, or Angiotensin-Receptor Blockers	• Weakness, • Ascending paralysis • Respiratory failure	• Electrolyte • ECG (peaked T waves flattened P waves, prolonged PR interval (first-degree heart block), widened QRS complex, deepened S waves, and merging of S and T waves can be seen)	• Glucose plus insulin • Diuretics • Sodium bicarbonate Nebulized with albuterol • Calcium chloride Dialysis
Hypoglycemia: low blood sugar	• History of alcohol/ drug use • Family History of DM • Unintentional weight loss • Related to meals and exercise • Acute renal failure/kidney injury • Children with Type 1 DM, aging, taking medications such as Sulfonylureas, Insulin, combination of Insulin and Non-Insulin, smoking	• Fast heartbeat • Shaking • Sweating. • Nervousness anxiety • Irritability confusion. • Dizziness • Hunger • Blurred vision • Seizure	• Fasting glucose • Hemoglobin • A1c • Insulin • Proinsulin • Cpeptide • Blood works	• If patient is awake: • Glucose tabs (4 tabs) • Juice (half cup) • Regular soda (half cup) • granulated sugar (4 tsp) • If Patient in unconscious: • Glucagon injection/IV

T'S	Clinical Presentation	Signs and Symptoms	Evaluation	Management
Thrombosis pulmonary	• History of DVT, or PE. • Contraceptives Pregnancy • Immobility advanced age Obesity • Bone fractures • Spinal injury Severe burn • Orthopedic surgery • Chronic illness • Cancer • Prolonged airline fight	• Shortness of breath • Pain in the calf or inner thigh • Swelling in the leg or arm. • Chest pain • Weakness on one side of the body • Sudden change in mental state.	• D-Dimer • CT Scan • Ultrasound	• Fibrinolytic drugs • Surgical Embolectomy • Mechanical thrombectomy may be considered for a massive PE.
Thrombosis coronary	• History of CAD MI • Previous PCI, or CABG • Hyperlipidemia • Obesity • DM • HTN • Sedentary lifestyle • Smoker	• Chest pain, • Shortness of breathing • Nausea • Lightheadedness • Profuse sweating	• ECG	• Oxygen • Aspirin • Nitroglycerin • Antiplatelet • Anticoagulant • Thrombolytic • Possible PCI CABG
Tamponade cardiac	• Large Acute MI • Chest trauma • Removal of Epicardial Pacing Wires after CABG	• Jugular vein distension • Low Blood pressure • Muffled heart sound	• Ultrasound • Auscultation	• Echocardiogram-guided pericardio-centesis
Toxins	• Poor eyesight Confusion • Memory loss • Disorientation • Mental Illness • Substance abuse • Suicidal ideation	• Unresponsiveness • Slow breathing • Apnea • Snoring or rattling sounds. • Cold or clammy skin. • Discolored lips or fingernails	• Toxicology level • History	• Maintain patent airway • Give antidote



CHAPTER 4

AIRWAY AND BREATHING MANAGEMENT

Chapter 4
Airway and Breathing Management

Learning Objectives:

At the end of this chapter, you should be able to:

- Describe how to open, clear, and use basic airway devices in any emergency situation.
- Discuss indications for the basics of airway management and advanced airway management.
- Explain how to use Bag- Mask- Ventilation, oropharyngeal and nasopharyngeal devices in a safe and effective way.
- Understand when to use advanced airway devices.
- Describe how to insert and confirm advanced airway device placements

Introduction

Airway management in emergency situations is critical because patients with respiratory distress can quickly progress to respiratory failure, respiratory arrest, and cardiac arrest.

Knowledge of the airway devices and procedures is important to practice safe and effective Airway Management for the patient, this includes skills such as opening the airway, suctioning, inserting an airway adjunct, administering supplemental oxygen, performing bag-mask ventilation, and intubation

Basic Airway Management

Opening the airway

The tongue is a common cause of airway obstruction in the unresponsive patient. When the unresponsive patient is supine and the soft tissues of the throat and the base of the tongue relax because of a loss of muscle tone, the tongue can fall into the back of the throat and block the airway.

If the patient is breathing, snoring respirations are a characteristic sign of airway obstruction caused by tongue displacement. In the apneic patient, an airway obstruction may go undetected until ventilation is attempted. Because the tongue is attached to the mandible, moving the patient's jaw forward lifts the tongue away from the back of the throat. Thus, manual airway maneuvers such as the head tilt–chin lift, or jaw thrust may be all that is needed to open the airway.

Head Tilt–Chin Lift

The head tilt–chin lift is the preferred technique for opening the airway of an unresponsive patient without a suspected cervical spine injury. To perform the head tilt-–chin lift, the patient should be placed in a supine position. Place the hand closest to the head on the patient's forehead.
Apply firm backward pressure with your palm to tilt the patient's head gently to the back. Place the tips of the fingers of your other hand under the bony part of the victim's chin. Gently lift the chin anteriorly to open the airway.

Figure 4.1 Head tilt-chin lift

Figure 4.2 Jaw Thrust Technique

Jaw Thrust

The manual maneuver recommended for opening the airway of a patient with suspected cervical spine injury is the jaw thrust without neck extension maneuver. To perform this maneuver, place the patient in a supine position.
While stabilizing the patient's head in a neutral position, grasp the angles of the patient's lower jaw with the tips of the middle or index fingers of both hands, one on each side, and lift, displacing the mandible upward and outward.
The combination of a head tilt, forward displacement of the jaw, and opening of the mouth is called the triple airway maneuver, or jaw thrust maneuver.

Suctioning

Suctioning is a procedure used to remove secretions from the patient's nose (nasopharynx), mouth (oropharynx), or trachea. Suctioning is indicated when there are signs of secretions in the airway such as a moist cough, bubbling of mucus, and drooling.

Suctioning attempts will not exceed 10 seconds. and a short period of 100% oxygen administration will be administered after the suctioning to prevent hypoxia.

Soft Suction Catheter

A soft suction catheter is a long, narrow, flexible piece of plastic used to clear thin secretions from the oropharynx, nasopharynx, or catheter can be inserted into the nares or mouth, through an oral airway or nasal airway, or through an endotracheal (ET) tube or tracheostomy tube

To apply the suction, gently insert the catheter without applying suction. To apply suction, cover the port on the catheter with your non-dominant thumb while withdrawing the catheter. Rotate the catheter between your dominant thumb and forefinger as it is withdrawn. While suctioning an ET tube or tracheostomy tube, rotate the catheter trachea.

A side opening is present at the proximal end of most catheters that are covered with the thumb to produce suction (In some cases, suctioning is initiated when a button is pushed on the suction device itself.)

Figure 4.3 Soft suction cathete

Rigid Suction Catheter

Rigid suction catheters are made of hard plastic angled to aid in the removal of thick secretions and particulate matter from the oropharynx A rigid suction catheter typically has one large and several small holes at the distal end through which blood and secretions may be suctioned.

Ensure that the suction device is powered on and that mechanical suction is present. Without applying suction, gently place the tip of the catheter in the child's mouth along one side until it reaches the posterior pharynx.

Slowly withdraw the catheter while applying suction, sweeping from side to side across the oropharynx to clear the airway. Ventilate the patient with supplemental oxygen before repeating the procedure.

As it is withdrawn, allow the removal of secretions on all sides of the tube. Ventilate the patient with supplemental oxygen before repeating the procedure

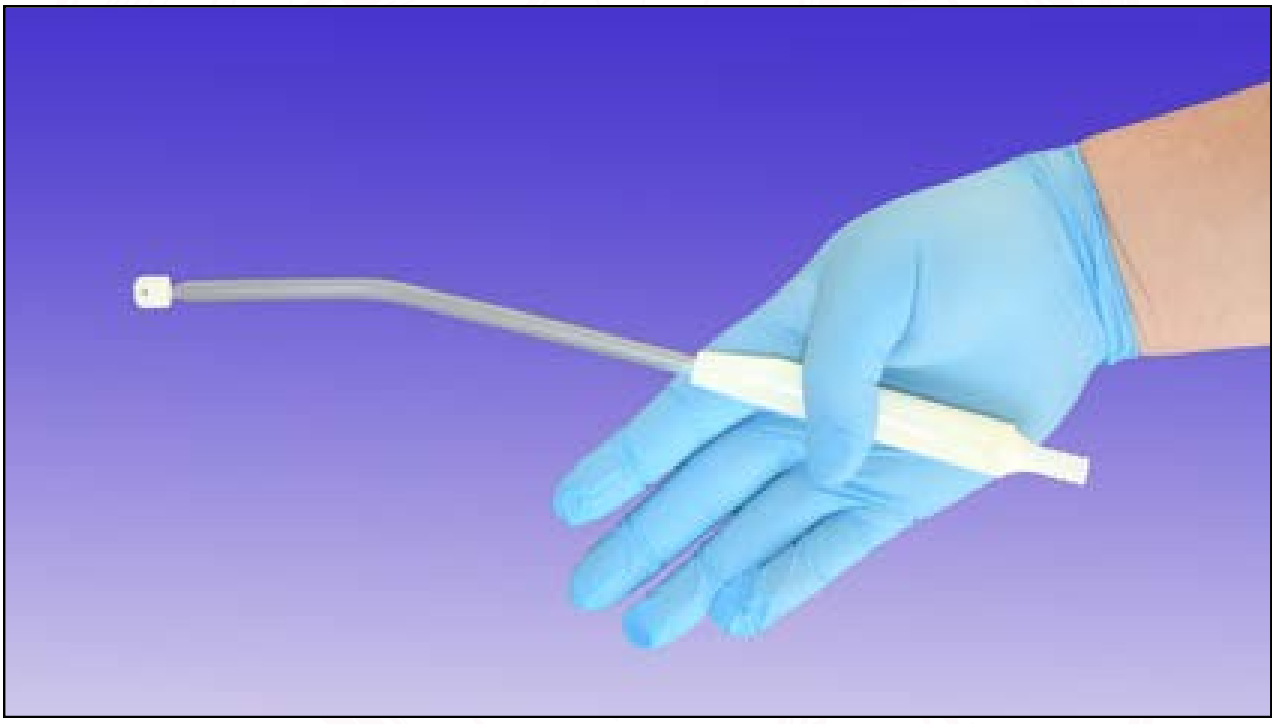


Figure 4.4 Rigid Suction Catheter

Basic Airway Adjuncts

Oropharyngeal and nasopharyngeal airways are adjuncts used to maintain an open airway by keeping the tongue away from the posterior pharynx. An oropharyngeal airway is inserted into the mouth and a nasopharyngeal airway is inserted into the nostril. Airway adjuncts are devices used to help keep a patient's airway open.

When using an airway adjunct, the patient's airway must first be opened by using one of the manual airway maneuvers previously described. After the patient's airway is open, insert the airway adjunct and maintain proper head position while the device is in place.

Oropharyngeal Airway

An oropharyngeal airway (OPA), also called an oral airway, is a curved plastic tube. The body of the device curves over the unresponsive patient's tongue, holding it away from the back of the throat. Because insertion may stimulate vomiting, an oral airway is not used in responsive or semi-responsive patients with a gag reflex.

Oral airways are available in many sizes that vary in length and internal diameter (ID). The size of the airway is based on the distance in millimeters from the flange to the distal tip.

Proper airway size is determined by holding the device against the side of the patient's face and selecting an airway that extends from the corner of the mouth to the angle of the lower jaw or earlobe

Selecting an airway of proper size is important because administration of an improperly sized device can affect the airway. If it's too long, it may press the epiglottis against the laryngeal opening, resulting in complete airway obstruction.

If the airway is too short, the device will not bypass the tongue and the obstruction by the tongue will not be relieved or the tongue may be pushed back into the throat, causing an airway obstruction.

Before inserting an oral airway, use personal protective equipment, open the airway, and ensure that the mouth and pharynx are clear of secretions.
After selecting an airway of proper size, open the patient's mouth and gently insert the airway device into the mouth so the point is toward the roof of the mouth or parallel to the teeth but do not press the tongue back into the throat, once the device is almost fully inserted, turn it until the tongue is cupped by the interior curve of the device.

Figure 4.5 Measuring OPA size

Nasopharyngeal Airway

A nasopharyngeal airway (NPA), also called a nasal trumpet or nasal airway, is a soft rubber, latex, or polyethylene tube designed to keep the tongue away from the back of the throat, used with patients with gag reflex.
Nasal airways are available in many sizes that vary in length and ID. Proper airway size is determined by holding the device against the side of the patient's face and selecting an airway that extends from the tip of the nose to the earlobe.

If it's too long it may stimulate the gag reflex or enter the esophagus, causing gastric distention and hypoventilation when ventilating with a bag-mask device. NPA that is too short will not extend beyond the tongue, thus it will not keep the tongue away from the posterior pharynx.
Before inserting a nasal airway, use personal protective equipment and open the airway. The nasal cavity is delicate and vascular. During insertion, do not force the airway because it may cause abrasions or lacerations of the nasal mucosa and result in significant bleeding, increasing the risk of aspiration.

After selecting a nasal airway of the proper size, liberally lubricate its distal tip with a water-soluble lubricant to minimize resistance and decrease irritation to the nasal passage.

Hold the device at its flange end like a pencil and slowly insert it into the patient's nostril with the bevel pointing toward the nasal septum, Advance the airway along the floor of the nostril, following the natural curvature of the nasal passage, until the flange rests against the outside of the nostril, if resistance is encountered, a gentle back-and-forth rotation of the device between your fingers may ease insertion.

If resistance continues, withdraw the airway, reapply the lubricant, and attempt insertion in the other nostril.

Figure 4.5 Measuring NPA size

Oxygen Administration

Oxygen therapy is typically titrated to achieve an oxygen saturation of 94% to 99% on pulse oximetry.
Different devices can deliver supplementary oxygen from 21% to 100% including

• Nasal Cannula

A nasal cannula is a low-flow oxygen delivery system that is used for patients who require only low levels of supplemental oxygen. The oxygen flow rate used with this device is 1 to 6 L/minute, which can deliver an oxygen concentration of 21% to 44%.

Figure 4.7 Nasal Cannula

• **Simple Face Mask**

A simple face mask, also called a standard mask, is a low-flow oxygen delivery device. The oxygen flow rate used with this device is 6 - 10 L/minute, which can deliver an oxygen concentration of 35% to 60%.

Figure 4.8 Simple Face Mask

• Non Rebreather Mask

A nonrebreather mask is a high-flow oxygen delivery device that does not permit the mixing of the patient's exhaled air with 100% oxygen. A one-way valve is located between the mask and reservoir bag to prevent the inhalation of external air.

When the patient breathes in, oxygen is drawn into the mask from the reservoir (bag) through the one-way valve that separates the bag from the mask. When the patient breathes out, the exhaled air exits through an open side port on the mask.

The one-way valve prevents the patient's exhaled air from returning to the reservoir bag (thus the name "nonrebreather"). This ensures a supply of 100% oxygen to the patient with minimal dilution from the entrainment of room air. A nonrebreather mask can deliver an inspired oxygen concentration of up to 95% - 100% at a flow rate of 10 to 15 L/minute.

Figure 4.9 Nonrebreather Mask

Table 3.4 Differential Diagnosis

Delivery Device	Oxygen Flow Rate, L/min	Oxygen Concentration
Nasal cannula Low flow High	1–6	21 – 44
Simple oxygen face mask	6 – 10	35-60 (AHA guidelines 2020)
Non-rebreather	6 –15	95 - 100
Bag mask	⩾ 15	MORE THAN 90

• Bag-Mask Ventilation

Bag-mask ventilation (BMV) is one of several methods that may be used to deliver positive-pressure ventilation during cardiac arrest, respiratory arrest, and with patients needing assisted ventilation.

A bag-mask device used without supplemental oxygen will deliver 21% oxygen (room air) to the patient. A bag mask should be connected to an oxygen source.

Attach one end of a piece of oxygen-connecting tubing to the oxygen inlet on the bag mask and the other end to an oxygen regulator. The oxygen flow rate should be at least 15 L/minute when using an adult bag.

Figure 4.10 Bag-Mask Ventilation

Technique to use Bag Mask Device

Select an appropriate bag for ventilation based on the patient's size. The bag should have an oxygen reservoir.

• Connect one end of the oxygen tubing to an oxygen source and the other end to an oxygen flow meter.

• Set the flow meter to the appropriate liter flow. Open the patient's airway.

• If needed, clear the patient's airway with suctioning. If the patient is unresponsive, insert an oral airway.

• Select a mask of appropriate mask size and place it on the patient's face.

• A properly sized mask extends from the bridge of the patient's nose to the groove between his or her lower lip and chin. Use of an improperly sized mask allows air to leak from between the mask and the patient's face, resulting in less oxygen being delivered to the patient.

• Position the narrow portion (apex) of the mask over the bridge of the patient's nose and the wide end (base) of the mask over the groove between the lower lip and chin.

• Avoid compressing the soft tissues of the face and neck, and ensure that the mask does not compress the eyes.

• Finger and hand placement for bag-mask ventilation is called the E-C clamp. Stabilize the mask in place with your thumb and index finger, creating a "C" around the ventilation port. With gentle pressure, push down on the mask to establish an adequate seal.

• Place your third, fourth, and fifth fingers along the bony portion of the patient's jaw, forming an "E." Use these fingers to lift the jaw and pull the patient's chin into the mask, creating a good mask seal.

• Slowly squeeze the bag with your other hand. Each breath is delivered over about 1 second, stop ventilation when you see a gentle chest rise. For rescue breathing Ventilate at a rate of 1 breath every 6 seconds and for cardiac arrest ventilate 2 breaths after 30 compressions.

• Bag-mask ventilation is optimal for two-rescuers: one to seal the mask to the face (ensuring a good mask-to-face seal) And maintain an open airway, the other to compress the bag with two hands. Ask an assistant to squeeze the bag with two hands until the patient's chest begins to rise while you press the mask firmly against the patient's face with both hands and simultaneously maintain proper head position. Release the bag as soon as the chest rise is visible.

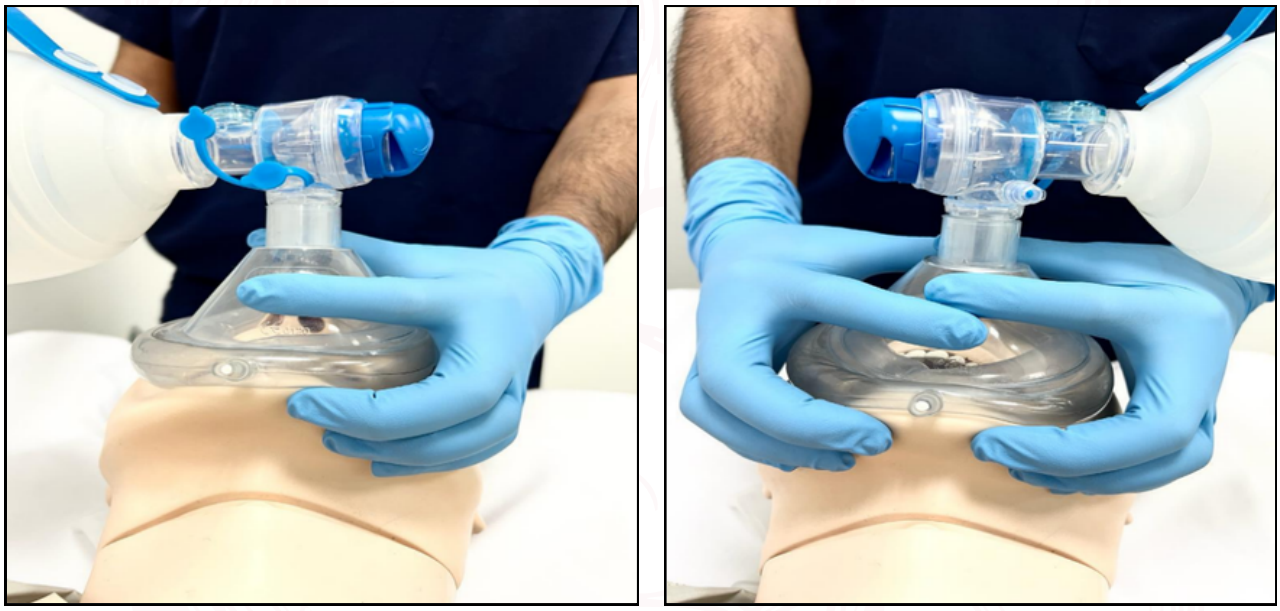


Figure 4.11 One and Two rescuers bag mask ventilation

Advanced Airway Management

Advanced airway devices may be categorized as Extraglottic Airway Devices (formerly called supraglottic airways) and Intraglotic Airway Devices.

Extraglottic Airway Devices

Are blindly inserted into unconscious patients without gag reflex (i.e., they do not require seeing the vocal cords) and rest between the base of the tongue and the glottis, permitting rapid oxygenation and ventilation.
Example of extraglottic airway devices Laryngeal Mask Airway (LMA)

To insert the Laryngeal Mask Airway device

- Deflate the cuff and Lubricate the posterior surface of the LMA.
- Preoxygenate with 100% O2.
- Open the airway and place LMA against a hard palate.
- Follow the natural curve of the patient's airway, and insert LMA until feel resistance
- Inflate the cuff with just enough air.
- Verify proper placement by checking chest expansion, lung sounds and use capnography to measure the concentration of CO2 at the end of exhalation.
- Waveform capnography is preferred and the most reliable and quantitative to confirm the placement but a colorimetric capnometry may be used when waveform capnography is not available (A yellow color suggests placement of the ETT in the trachea, a lack of CO2 (no color change) suggests tube placement in the esophagus
- Secure with tape or tube holder.

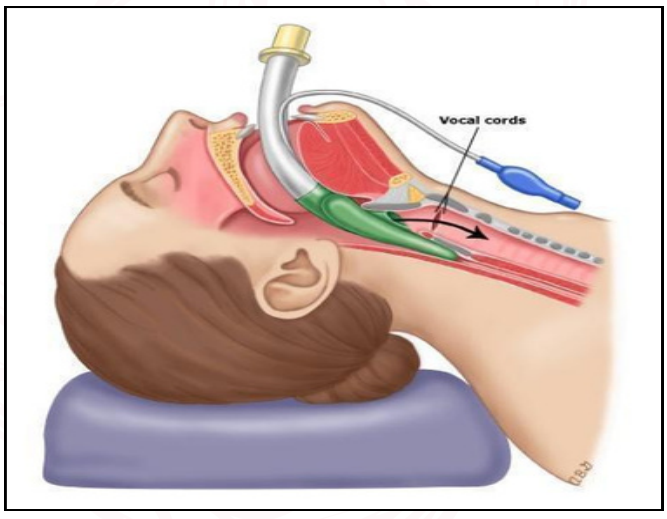


Figure 4.12 Laryngeal Mask Airway device

Intragalactic Airway Devices

Endotracheal tube is an example of an Intragalactic Airway device.
Endotracheal intubation advanced airway procedure in which a tube is placed directly into the trachea. This procedure requires special training and frequent refresher training to maintain skill proficiency.
Endotracheal intubation may be performed for a variety of reasons including for delivering anesthesia, maintaining oxygenation, providing positive-pressure ventilation, and protecting the patient's lower airway from aspiration.

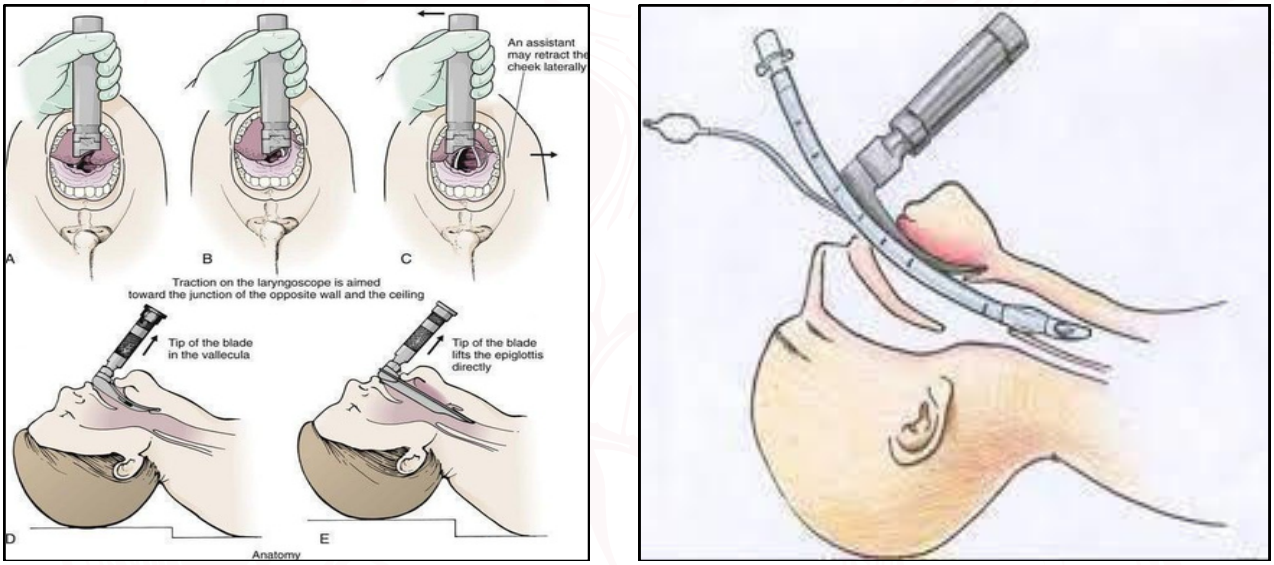
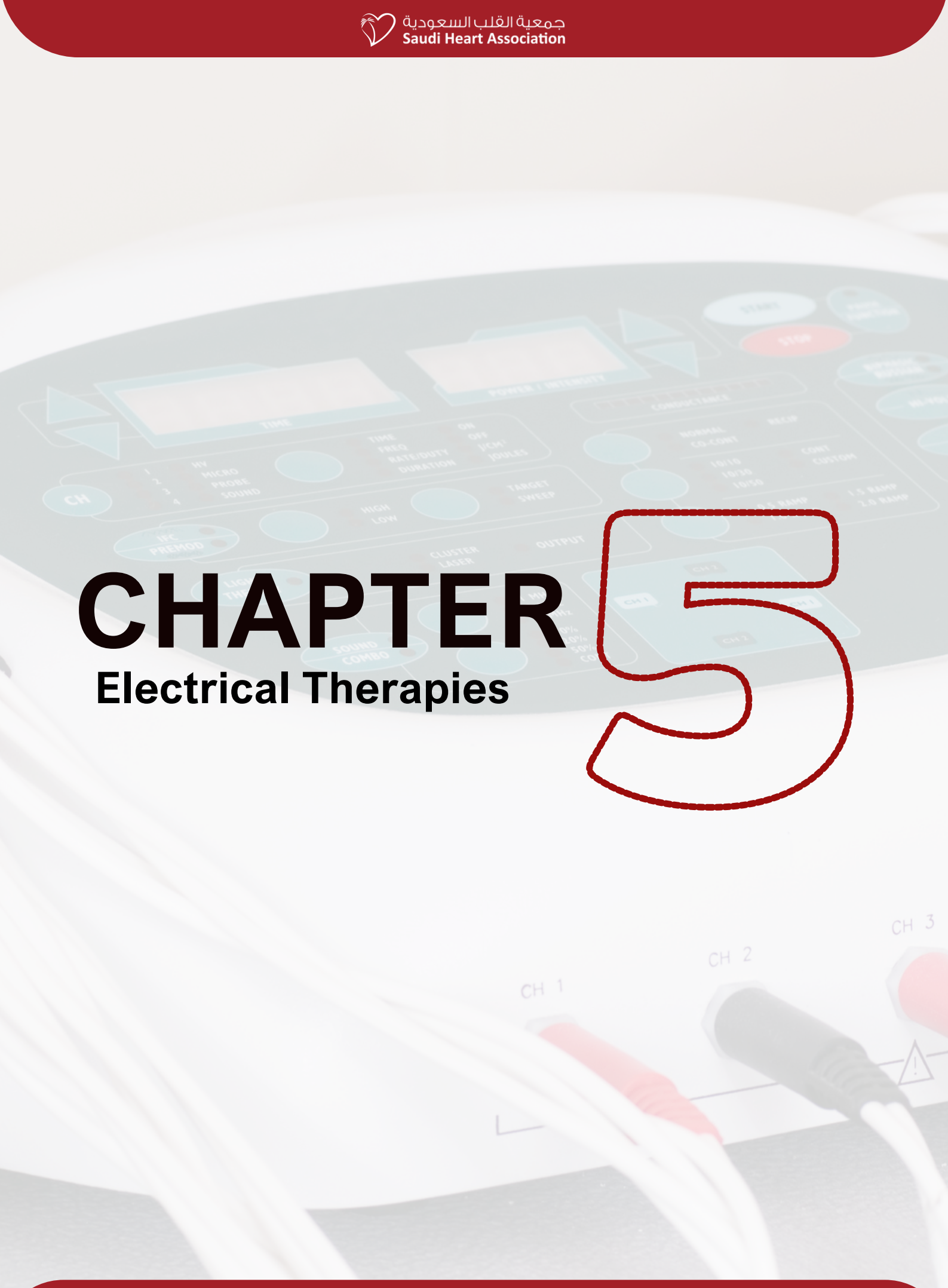


Figure 4.13 Endotracheal intubation

To insert Endotracheal Tube

Pre-oxygenate with 100% O2.
• Insert the stylet and lubricate the tube
• Open airway sniffing position and clear secretion if needed
• Lift tongue leftward and visualize glottic opening by using laryngoscope
• Insert the endotracheal tube through the vocal cords
• Remove the laryngoscope
• Verify proper placement by Check chest expansion, lung sounds and Use capnography
• Secure the tube in place using a commercial tube-holder or tape
Ventilation with an advanced airway at a rate of 1 breath every 6 seconds for respiratory and cardiac arrest.



CHAPTER 5
Electrical Therapies

Chapter 5
Electrical therapies

Learning Objectives:

At the end of this chapter, you should be able to:

- Discuss indications for electrical therapies
- Know how to connect the defibrillator machine and use it as a cardiac monitor.
- Recognize how to use the defibrillator machine to give unsynchronized and synchronized shock in a safe way.
- Understand the use of the defibrillator machine as external transcutaneous pacing.

Introduction

Electrical therapies include manual defibrillation, synchronized cardioversion, and transcutaneous pacing, and it's important to the operator to be well-trained and knowledgeable about the type of device being used, the manufacturer's suggested paddle/pad size and positioning, and the required energy levels for the dysrhythmia being treated before delivering electrical therapy to a patient.

Manual Defibrillation

A defibrillator is a device that gives an electrical shock to the heart to stop it from beating abnormally. The energy content of the electrical shocks used for defibrillation and cardioversion is measured in joules (J). Current is administered from the defibrillator to the patient through handheld paddles or self-adhesive monitoring/defibrillator pads. The patient's heart rhythm is also recorded and monitored using self-adhesive pads.

Figure 5.1 Defibrillator machine

Paddle/Pad

Follow the manufacturer's directions for paddle/pad position, adults normally use the anterolateral pad position, and may use the anteroposterior pad position

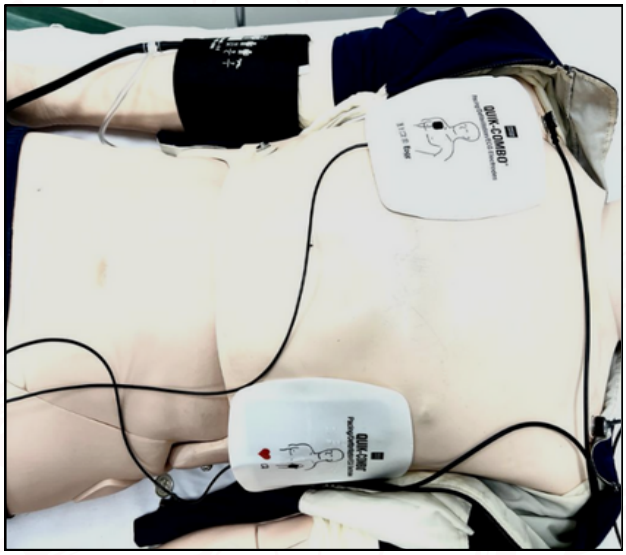


Figure 5.2 Paddle/Pad Position

Anterolateral Placement:

Place the sternal pad on the patient's right side adjacent to the upper sternum, below the clavicle. Place the apical pad on the patient's left side over the fourth and fifth intercostal spaces, with the center of the pad at the midaxillary line.

Anterior-Posterior Placement: Place the anterior pad on the patient's left side over the fourth and fifth intercostal spaces, with the center of the pad at the midaxillary line. Place the posterior pad in the left infrascapular region. For the energy doses follow the defibrillator manufacturers for initial and subsequent doses.

Defibrillation can treat shockable cardiac arrest rhythms (ventricular fibrillation and pulseless ventricular tachycardia) by delivering an unsynchronized electrical current (energy delivery has no relation to the cardiac cycle) through the heart for a short period of time.

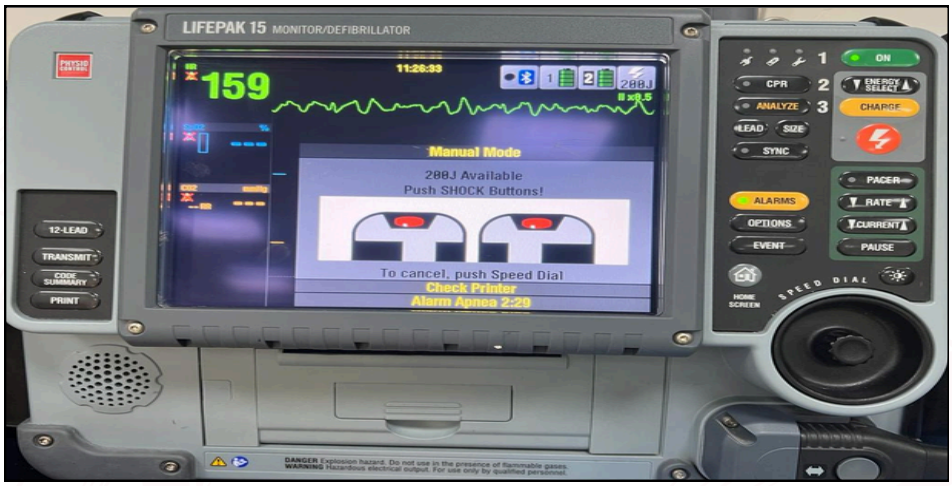


Figure 5.3 Defibrillation

Synchronized Cardioversion

Synchronized Cardioversion is a shock that is “timed” or “programmed” for delivery during ventricular depolarization in synchronized cardioversion (QRS complex). When you push the “sync” button, the machine’s synchronization circuit looks for QRS complexes and shows a” flag” or “sync marker” on the ECG display, which might be a square, line, or highlighted triangle, depending on the machine and administers the shock a few milliseconds after the QRS; that why it's important to press and hold the panels until shocked delivered.

Because synchronized cardioversion can be painful, give sedation unless the patient’s condition is deteriorating rapidly.

Energy doses depend on the arrhythmia and the type of defibrillator. If the rhythm did not convert from the first shock, increase the energy level in a stepwise fashion, charge the pads, and deliver a shock.

Synchronized cardioversion is first-line therapy for patients with tachyarrhythmia with a pulse and signs of hemodynamically unstable.

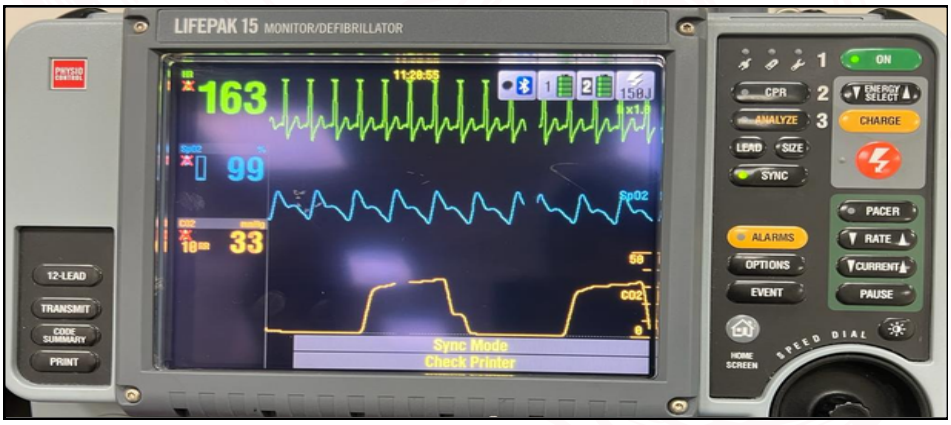


Figure 5.4 Synchronized cardioversion

Transcutaneous Pacing

Transcutaneous pacing is indicated for patients with bradyarrhythmia and signs of hemodynamically unstable that are not responsive to pharmacologic therapy. When the bradycardia rhythm is a total AV block, this is especially true.

Same synchronized cardioversion, transcutaneous pacing can be painful for the patient, so administer sedation or analgesia if the patient's condition permits, in an intubated patient, neuromuscular blockers may be considered.

Set the cardiac monitor/defibrillator to pacing mode, and then set the demand rate and the current milliamps output. Gradually increase the current milliamps output until electrical capture (wide QRS complexes and tall, broad T waves following each pacing spike) is observed on the monitor.

Confirm mechanical capture by assessing the patient for clinical signs such as an improved peripheral pulse, an increase in blood pressure, an improved level of consciousness, and improved skin color and temperature.

A skin examination should be performed on a regular basis (at least every 30 minutes).

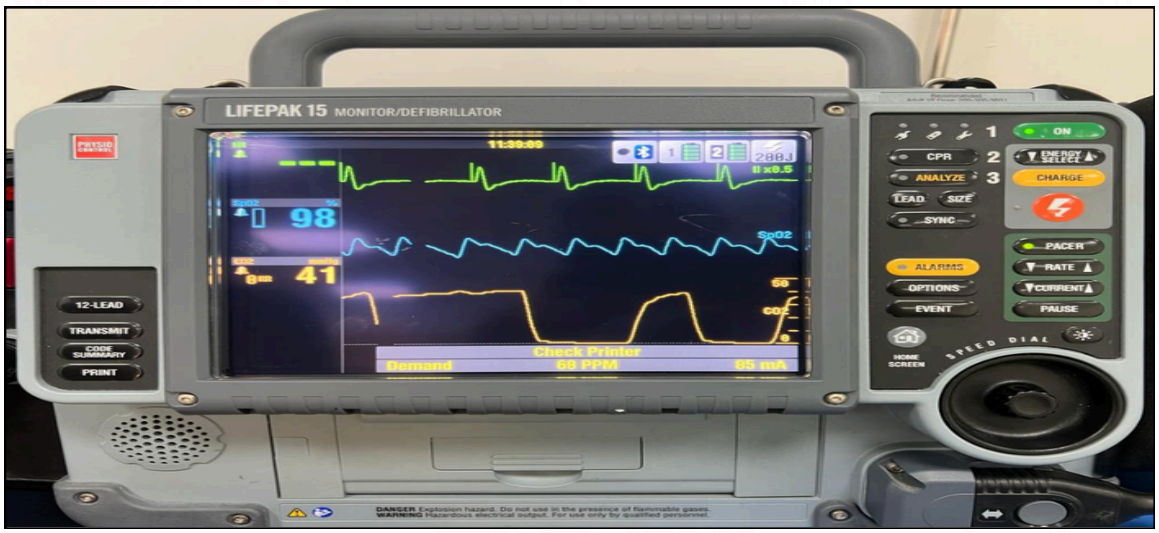
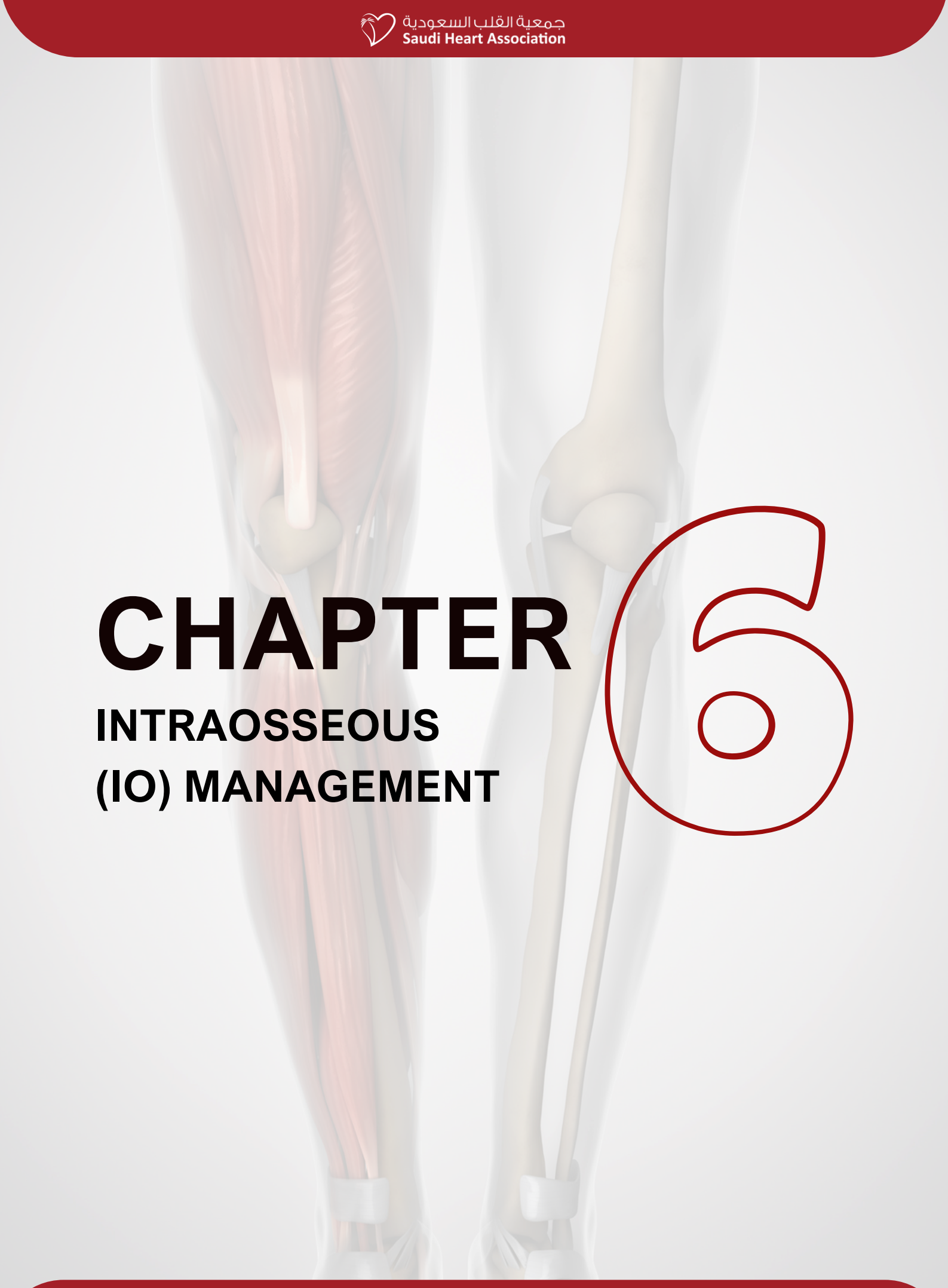


Figure 5.5 Transcutaneous Pacing



CHAPTER 6

INTRAOSSEOUS (IO) MANAGEMENT

Chapter 6
Intraosseous (IO) Management

Learning Objectives:

At the end of this chapter, you should be able to:

- Understand the indications and contraindications of Intraosseous.
- Identify the proper sites of IO insertion.

Introduction

In the management of cardiopulmonary arrest and hypotensive shock, the preferred vascular access site is the largest, most readily accessible vein. If no IV is in place at the onset of a cardiac arrest, the intraosseous route is useful as the initial means of vascular access.

Peripheral Venous Access: Peripheral venous access is an effective route for fluid and medication administration that does not require interruption of resuscitation efforts. The peripheral route is acceptable during resuscitation if it can be achieved rapidly

Intraosseous Infusion (IO) is the process of infusing medications, fluids, and blood products into the bone marrow cavity. Because the marrow cavity is continuous with the venous circulation, fluids and medications administered by the IO route are subsequently delivered to the venous circulation.

An IO should be established when peripheral IV access cannot be rapidly achieved (Box 5.1). Manual pressure, a syringe, a pressure infuser bag (alternately, a blood pressure cuff inflated at 300 mmHg may be used), or an infusion pump should be used when administering viscous medications or rapid fluid boluses.

Table 6.1 Clinical Indications for Intraosseous Infusion

Anaphylaxis
Cardiac arrest
Edema or obesity
Intravenous drug abuse
Loss of peripheral veins because of previous attempts
Intravenous therapy
Massive trauma or major burns
Sepsis
Severe dehydration
Shock with vascular collapse

IO is considered a temporary means of vascular access because it is presumed that the longer the needle remains in place, the greater the risk of infection and possible dislodgement.

The manufacturers of some IO devices recommend the removal of the IO within 24 hours. Venous access is often easier to obtain after initial fluid and medication resuscitation by means of the IO route.

Possible sites for IO access are shown in Table 5.1 and contraindications related to IO access.

The technique used for IO needle insertion depends on whether the IO needle is inserted manually or with a powered insertion device

Table 6.2 Common Intraosseous Infusion Sites

Bone	Insertion Site
Proximal Tibia	1 to 3 cm (about the width of 1 to 2 fingers) below and medial to the tibial tuberosity on the flat surface of the tibia
Distal Tibia	1 to 2 cm proximal to the medial malleolus in the midline
Distal Femur	2 to 3 cm above the femoral condyles in the midline
Head Of Humerus	About two finger widths below the coracoid process and the acromion
Sternum	Manubrium
Iliac Crest	At the most prominent aspect of the iliac crest, with direction of insertion being perpendicular to the surface of the bone

Preparation for IO insertion

• Materials/Equipment
• Patient

Procedure

• Select the appropriate IO size/system
• Stabilizes the site on a firm surface
• Disinfect the skin
• If the patient is conscious, consider infiltration of the skin with 1% lidocaine.
• Insert the needle into the bone at 90-degree angle
• Confirm Correct placement

Confirm the needle placement

• The needle is firmly in the bone and remains upright without support
• Aspirate bone marrow or blood
• Flush the needle with a small amount of saline without any swelling
• Administer fluid by free flow through the needle

If signs of infiltration or extravasation are present, remove the IO needle and attempt the procedure at another site.

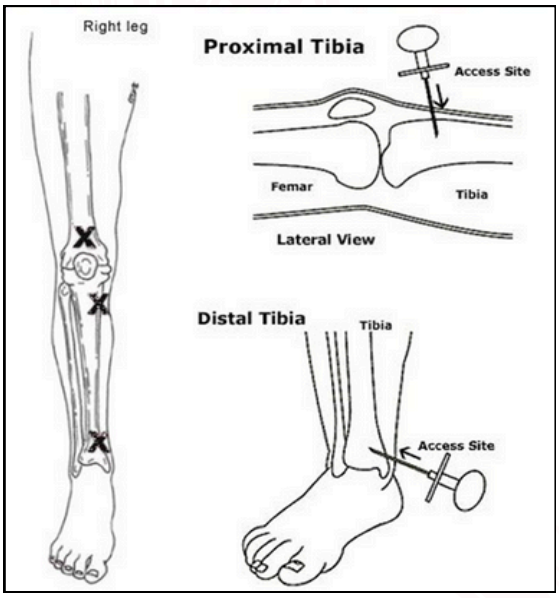


Figure 6.1 Intraosseous Infusion Sites

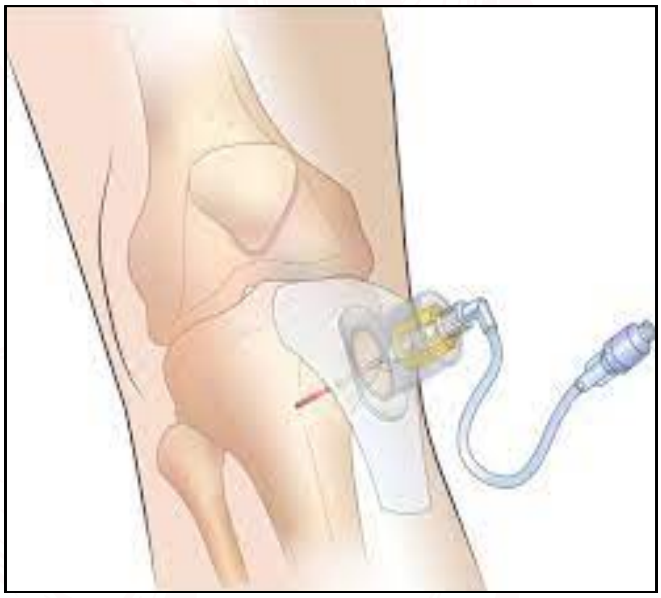


Figure 6.2 IO insertion

Infiltration is the inadvertent administration of a non-vesicant (non-irritating to human tissue) solution or medication into surrounding tissue because of catheter dislodgement.

Extravasation is the inadvertent administration of a vesicant (irritating to human tissue) solution or medication into surrounding tissue because of catheter dislodgement. If no signs of infiltration or extravasation are present, attach standard IV tubing. Manual pressure, a syringe, a pressure infuser, or an IV infusion pump may be needed to infuse fluids

Intraosseous contraindications:

- Long bone fracture.
- Vascular injury of the extremity.
- Cellulitis.
- Previous orthopedic procedure (including a previous attempt).
- Abscess.
- Osteomyelitis.

CHAPTER 7

Drugs of resuscitation

Chapter 7

Drugs of resuscitation

Learning Objectives:

By the end of this chapter, you should be able to:

- List the various emergency drugs used during resuscitation.
- Identify the appropriate indications for each drug.
- Understand how to prepare and administer the correct medication.
- Recognize specific considerations when administering medication.

Introduction

Pharmacologic interventions continue to be a fundamental part of advanced life support, although no clinical data indicating that any drug improves long-term survival after CA. In addition, there is inadequate evidence to define the optimal timing, dose, or order for drug administration.

The Cardiac Arrest (CA) primary goal of pharmacologic therapy during CA is to facilitate restoration and maintenance of a perfusing and spontaneous rhythm. Vasopressors and antiarrhythmics are the main drug categories used in CPR algorithms.

Drug therapy is recommended after effective cardiopulmonary resuscitation and defibrillation in cardiac arrest. Some drugs appear to have short-term benefits, such as improved survival to hospital, e.g. vasopressor and antiarrhythmics. Hence, they have been included in the cardiac life support algorithm.

Routes of Administration

- Intravenous (IV)
- Avoid (where possible) the use of lower limb veins due to impairment of venous return below the diaphragm in cardiac arrest
- Follow drug administration with at least 20-30 mL of fluid (in adults) and ongoing cardiac compressions
- If a central line is present, it should be used
- In newborns, an umbilical vein catheter is the suggested route

• **Intraosseous (IO)**
• Preferred if IV is not available
• Suitable for fluid resuscitation, drug delivery (at the same doses), and laboratory evaluation (do yourself a favor, and don't try to run a blood gas from the IO through your analyzer).

• **Endotracheal (ET)**
• If IV/IO cannot be attained, and an ETT is present, administration of SOME medications is possible, with variable absorption
• Give maximum of 3 dose diluted in 10 mL of water to aid in absorption
• Some drugs recommended are: Adrenaline, lignocaine, and atropine
• Other drugs may cause mucosal and alveolar damage
• This is NOT recommended if a laryngeal mask airway (LMA) is present

Table 7.1 Drugs for Resuscitation

Drug	Dose/Route	Indication	Special Consideration
Atropine	1mg IVP every 3-5 minutes' interval maximum of 3mg	Symptomatic bradycardia	Can be given through ETT Use with caution in MI Contraindicated to heart transplant patients
Dopamine	Infusion: 5-20mcg/kg/min Titrate to patient response		It can be used when atropine or pacing fails Use with caution in cardiogenic shock Congestive Heart Failure (CHF)
Epinephrine	Infusion: 2-10 mcg/min Titrate to patient response		It can be used when atropine or pacing fail
	1 mg IVP flush with 20 ml of NS every 3-5 minutes	VF, Pulseless V-Tach, Asystole, Pulseless, Electrical Activity	Can be given through ETT Elevate the arm for 10 to 20 seconds after the dose
Adenosine	6 mg rapid IVP (1st dose) followed by 20 ml NS 12 mg rapid IVP (2nd dose) can be given in 1-2 minutes	Stable narrow complex SVT	If vagal maneuvers are unsuccessful 1st dose may be given to unstable narrow complex SVT while preparing for cardioversion
	6 mg rapid IVP	Monomorphic wide complex tachycardias that may possibly be SVT	
Amiodarone	150mg over 10 minutes rapid infusion	Stable monomorphic wide complex (VT)	Repeat as needed if VT recurs Maintenance infusion of 1 mg/min for 6 hours
	300 mg IVP (1st dose) 150 mg IVP (2nd dose)	Ventricular Fibrillation Pulseless V-Tach	
Esmolol Propranolol	0.5 mg/kg IVP followed by 50-300mcg/kg/min. 0.5-1 mg over 1 minute repeated as needed up to a total dose of .01 mg/kg.	Atrial Flutter Stable Atrial Fibrillation stable	
Diltiazem	15-20 mg IVP over 2 minutes repeat after 20 minutes over 2 minutes		Monitor the BP

Lidocaine	1 - 1.5 mg/Kg IVP 1st dose 0.5-0.75 mg/kg IVP 2nd dose every 5-10 minutes up to 3.0 mg/Kg	Replacement of amiodarone in VF/PVT	
Magnesium Sulfate	LD: 1 to 2 g IV at 5-10 minutes interval maximum dose of 3mg/kg	Torsades de pointes Stable	
Oxygen		Shortness of breath Suspected ischemic pain Suspected stroke with <94% O2 sat ACS patients with <94% O2 sat ROSC 92%-98%	Use caution when giving in patient with a shock
Aspirin	160-325 mg p.o chewed	ACS	Hypersensitivity to the drug Contraindicated in patients with active ulcer disease or asthma
Nitroglycerine	1-tab SL can be repeated for a total of 3 doses at 5 minute intervals 1-2 sprays SL at 5 minutes' interval maximum of 3 sprays within 15 minutes 12.5 to 25 mcg IV bolus if SL or spray not given	Ischemic chest pain, Angina Acute MI CHF pulmonary edema	Contraindicated to: RV infarction Severe bradycardia Severe tachycardia Hypotension Used phosphodiesterase within 24 hours
Morphine	2-4 mg slow IVP prn. May give additional doses of 2 to 8 mg IV at 5-15 minutes' intervals. at 5-15 minutes intervals. NSTE-ACS: Give 1-5 mg IV only if symptoms are not relieved by nitrates or if symptoms recur	AMI chest pain if nitrates ineffective CHF pulmonary edema	Use with caution in RV infarction Keep naloxone handy
	Infusion: 5-20mcg/kg/min Titrate to patient response	Post arrest Hypotension	
	Infusion: 2-10 mcg/min Titrate to patient response		

CHAPTER 8

MULTI-RESCUERS TEAM

Chapter 8
Multi-Rescuers Team

Learning Objectives:

At the end of this chapter you will be able to learn:

- How to apply your skills in a Multi-Rescuers resuscitation effort?
- Understand the components of Multi-Rescuers Team Dynamics.
- Explain the importance of the multi-rescuers team's components.

Component of Effective Multi-Rescuers Team Dynamics

During a resuscitation effort, the multi-rescuer team depends highly not only on high-quality CPR. Team members' understanding of each role involved in the resuscitation effort and working in a sequence with each other are bound to a successful resuscitation.

Multi-Rescuers Team Dynamics components:

- Roles and obligations
- Communication
- Debriefing

Roles and Obligations:

Determining precise roles and obligations as soon as feasible is crucial since every second counts during a resuscitation effort. The multi-rescuer team roles should be developed and assigned at the beginning of each shift, according to local protocols as per SHA recommendations.

Knowing the role and obligations before resuscitation begins will help the team avoid losing valuable time that could have improved the success of the resuscitation effort.

A. THE 6 ROLES AND OBLIGATIONS:

1.Team Leader

• Responsible for delegating the roles to each team member in accordance with their scope of practice.
• Gets to determine the course of treatment.
• Overseas and maintain a close watch on the team's performance to make sure that all procedures and technical skills have been carried out admirably.

2. Compressor

• Applying chest compression triangle (CCT).
• Alternating roles every two minutes, or sooner if you are fatigued.
• Concentrate on listening to the CPR coach›s instructions and feedback for further guidance.

3. Airway

• Properly ensure an open airway is maintained.
• Insert appropriate airway adjuncts.
• Provide ventilation and oxygenation

4. AED/Monitor/CPR Coach;

• Operates the AED/Manual Defibrillator safely.
• Delivers energy in accordance with the manufacturer's recommendation
• Ensure high-quality CPR is being performed.

5. Medication/IV;

• Establishes IV/IO access
• Preparation and administration of medication.
• Extraction of blood sample

6. Recorder;

• Manage the time
• Document accurately the sequence of events during resuscitation

Figure 8.1 The 6 Roles

B. COMMUNICATION:

• Respect for one another;

It is essential for effective communication, which will result in a successful performance by the multi-rescuers team. In the case that a mistake was to occur, prompt action should be taken to stop it from happening, but it should be handled in such a manner that respect is still a basis for immediate corrective instructions.

• Effective communication;

The use of effective communication would help the resuscitation team to avoid errors.

The team leader should give clear and concise orders to each team member, maintaining eye-to-eye contact in a calm and loud tone.

Team members should confirm the order once received and completed by repeating the order back to the team leader.

• **Debriefing:**

Debriefing is necessary when the resuscitation effort is completed and should be immediately done right after the resuscitation.
The purpose of the debriefing is not to provide feedback on the performance of each team member, but rather to assess the performance of the multi-rescuers as a whole team to pinpoint their strengths and weaknesses in areas such as but not limited to communication, role, and responsibilities, medical skills and interventions for further practices and improvements to improve patient survival and multi-rescuers' team performance.

Rapid Response Team

A Rapid Response Team (RRT) is a group of healthcare providers specifically trained to respond quickly to emergencies and critical situations in a healthcare setting. When a patient's condition deteriorates or there is a sudden change in their vital signs, the RRT is activated to provide immediate assessment, intervention, and potentially life-saving measures.

The goal of the RRT is to prevent unexpected deaths, reduce complications, and improve patient outcomes by swiftly addressing any medical emergencies that may arise within the hospital.

The RRT also provides valuable support and guidance to other healthcare professionals, offering expertise and assistance in managing complex cases or challenging situations.

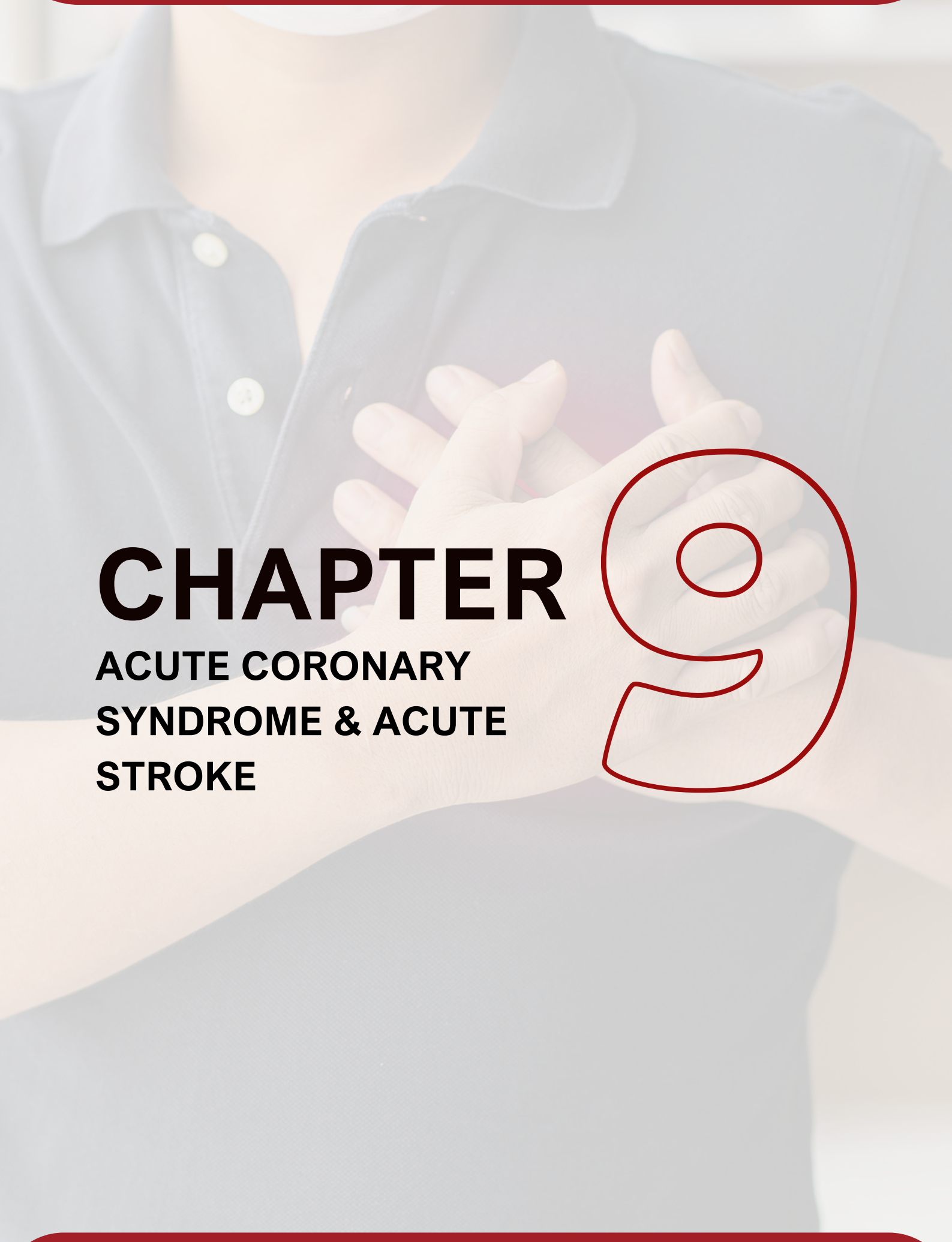
Overall, the presence of a dedicated RRT greatly enhances the effectiveness and efficiency of the healthcare team, leading to better outcomes for patients. Moreover, the presence of the RRT instills a sense of confidence and reassurance among both patients and their families, knowing that there is a specialized team readily available to respond to any emergencies that may arise.

By having a dedicated team like the RRT, hospitals can ensure that patients receive prompt and specialized care during critical situations. The RRT is equipped with the necessary equipment and expertise to stabilize patients and initiate emergency proced**ures if needed.**

This proactive approach helps to minimize the risk of further deterioration and allows for timely intervention, ultimately improving the overall quality of care provided by the healthcare facility.

Criteria for RRT Activation

• Respiratory rate should either be lower than six breaths per minute or higher than thirty breaths per minute.
• Heart rate of less than 40 beats per minute or greater than 140 beats per minute.
• Systolic blood pressure (SBP) is less than 90 mm Hg.
• Hypertension with symptoms.
• Sudden decline in the level of consciousness.
• Presence of unexplained agitation.
• Seizure.
• A noticeable reduction in urine production.



CHAPTER 9

ACUTE CORONARY SYNDROME & ACUTE STROKE

Chapter 9
Acute Coronary Syndrome & Acute Stroke

Acute Coronary Syndrome

Learning Objectives:

By the end of this chapter, students will be able to

- Identify acute coronary syndrome
- Recognize the warning signs of ACS
- Appropriate treatment for ACS

Definition

Acute coronary syndrome is a condition that occurs due to a sudden decrease or blockage of blood flow to the heart muscle. It is typically caused by the formation of blood clots within the coronary arteries, which supply oxygen and nutrients to the heart. This condition is considered a medical emergency as it can lead to a myocardial infarction or other serious complications if not treated promptly.

Symptoms of acute coronary syndrome may include

- Chest pain or discomfort.

Shortness of breath.

- Nausea.
- Lightheadedness.

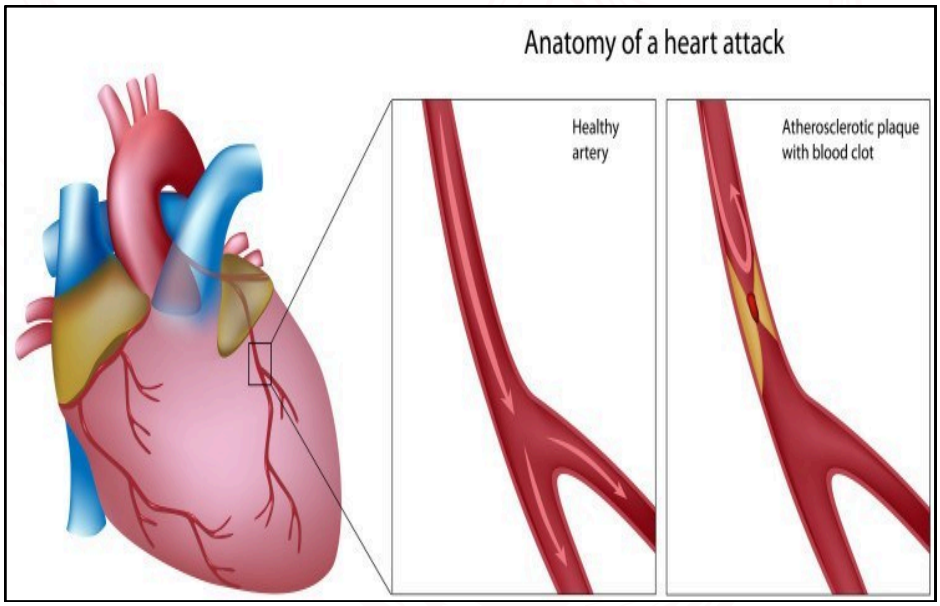


Figure 9.1 blood clots within the coronary arteries

Management:

Initial Management (Out Hospital)

• Early notification from the EMS and early activation of the STEMI code is crucial.
• Primary assessment.
• Obtain IV access.
• Maintain a patent airway and oxygen level.
• 12 leads ECG.
• Obtain full vitals.

MONA mnemonic which stands for

• Morphine
• Oxygen
• Nitroglycerin
• Aspirin

Nitroglycerin should not be given to patients with:

• Inferior MI with RV involvement.
• Systolic blood pressure is less than 90.
• Bradycardia less than 50 bpm.
• Use of phosphodiesterase inhibitors within 24 hours.

In Hospital Management

• Primary and secondary re-assessment
• Obtain 12 lead ECG, blood investigation
• Obtain Vital signs
• Notify the cardiac Cath lab

Fibrinolytic therapy. Door-to-needle should be below 30 minutes.
Percutaneous coronary intervention (PCI) Door-to-balloon is 90 minutes.

Possible Result of ECG

STEMI stands for ST-segment elevation myocardial infarction, which occurs when there is a complete blockage in one of the coronary arteries, leading to a significant amount of heart muscle damage.

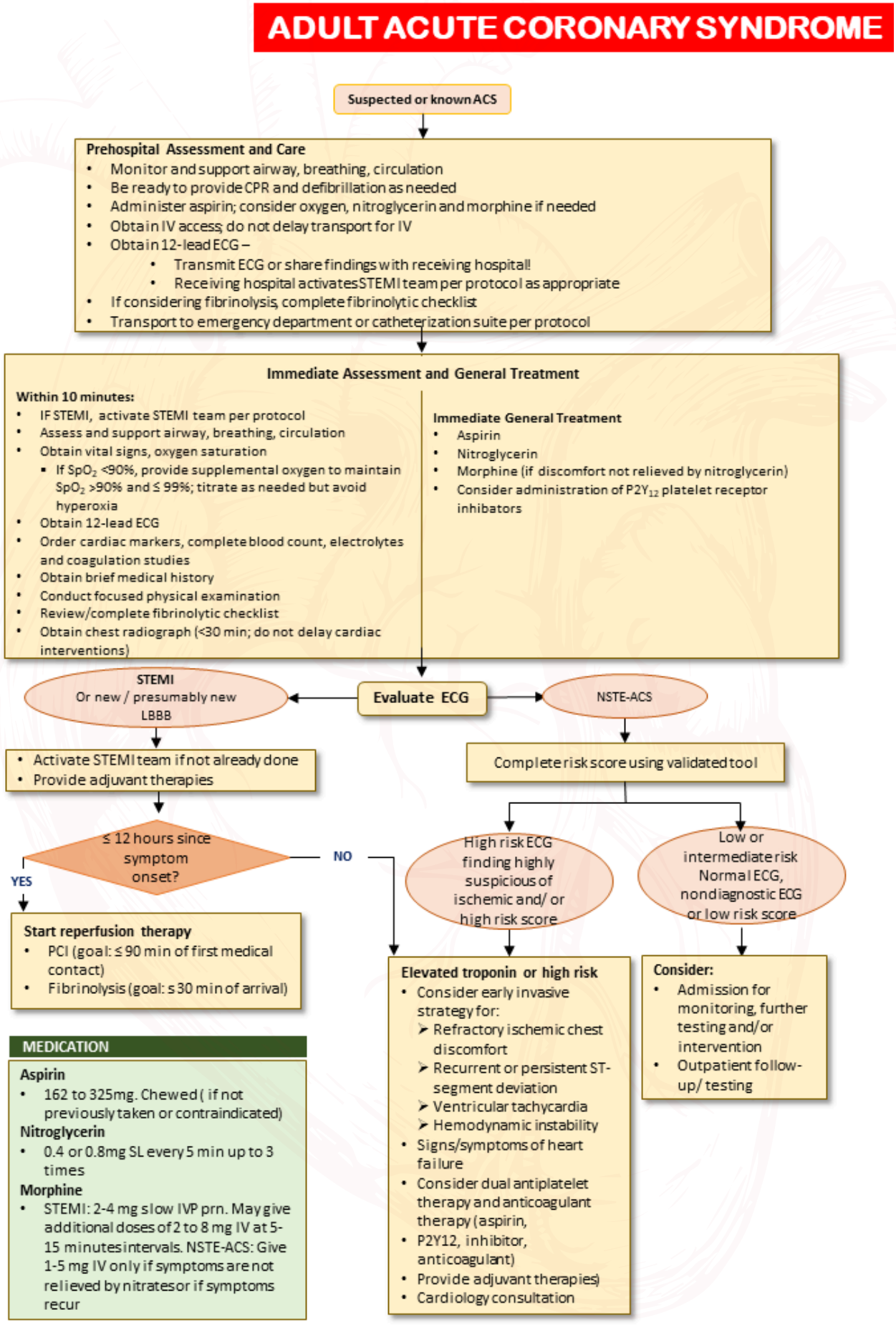
NSTEMI- non-ST-segment elevation myocardial infarction, where there is a partial blockage in one or more of the coronary arteries, resulting in less severe heart muscle damage. Both types require immediate medical attention and treatment to prevent further complications.

Table 9.1 STEMI ECG Findings

I (Lateral)	aVR (Not Assessed)	V1 (Septal)	V4 (Anterior)
II (Inferior)	aVL (Lateral)	V2 (Septal)	V5 (Lateral)
III (Inferior)	aVF (Inferior)	V3 (Anterior)	V6 (Lateral)

I Lateral Circumflex Artery	aVR	V1 Septal Left Anterior Descending Artery	V4 Left Anterior Descending Artery
II Inferior Right Coronary Artery	aVL Lateral Circumflex Artery	V2 Septal Left Anterior Descending Artery	V5 Lateral Circumflex Artery
III Inferior Right Coronary Artery	aVF Inferior Right Coronary Artery	V3 Left Anterior Descending Artery	V6 Lateral Circumflex Artery

Algorithm 9.1 Adult Acute Coronary Syndrome



Acute Stroke

Learning Objectives

By the end of this chapter, you will be able to

- Understand the meaning of stroke
- Distinguish between ischemic and hemorrhagic strokes
- Recognize the warning signs of stroke
- Summarize appropriate treatment for stroke

STROKE

Is a medical condition in which a part of the brain doesn't get enough oxygen due to artery blockage or bleeding. Lack of oxygen supply to the brain can cause cell death, a life-threatening condition where every second matters.

If you see someone having symptoms of stroke, call for help (activate EMS). The earlier the stroke is treated the better the outcome. Early recognition and immediate intervention to patients with stroke is within the scope of practice of a healthcare provider.

Types of Stroke

- **Ischemic Stroke** The most common type of stroke. Blood vessels in the brain are occluded due to fatty deposits, blood clots that travel through the bloodstream. This occlusion can cause severely reduced blood flow (ischemia).
- Hemorrhagic Stroke The blood vessel in the brain leaks or suddenly ruptures.
- **Transient Ischemic Attack (TIA**) Mini stroke —symptoms are similar to a stroke but this may last for maximum 24 hours (5 minutes) and causes a temporary decrease in blood supply to part of the brain. Having such a condition may increase the risk of having a full-blown stroke later

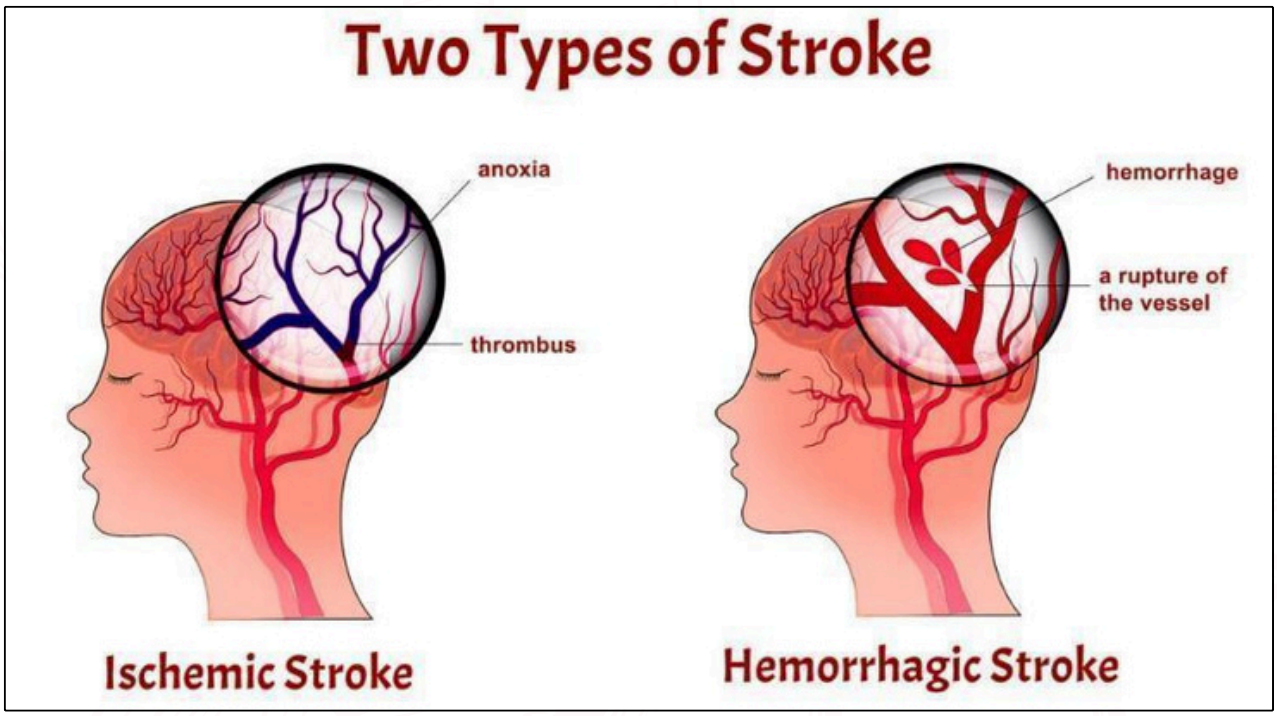


Figure 9.2 types of stroke

Clinical Presentation

- Sudden weakness on one side of the body (face, arm, leg)
- Sudden confusion
- Loss of ability to speak
- Trouble in walking or loss of balance and coordination
- Sudden severe headache with unknown cause
- Visual disturbances
- Dizziness

Stroke Care

The ultimate goal of stroke care is to lessen brain injury and boost the patient's recovery. The stroke chain of survival combines the systematic actions taken by the patient, his family, and healthcare providers to maximize recovery.

Stroke Chain of Survival

- Rapid detection and reaction to the warning signs and symptoms of stroke
- Early EMS activation and dispatch
- Rapid EMS identification of stroke, intervention, triage, transport, and prehospital notification
- Rapid diagnosis and treatment in the hospital




EMS Assessment and Management

• Support ABCs: (Airway, breathing, and circulation. Provide Oxygen if necessary.
• Conduct physical assessment
• Conduct prehospital stroke assessment using the pre-hospital screen and severity tool.
• Establish the time the patient was last seen normal (symptoms onset)
• Obtain the patient's history (comorbid condition, recent surgery, medications especially anticoagulants)
• Transport the patient to the nearest stroke center facility
• Check glucose level and treat if needed
• Notify the receiving hospital of possible stroke patients so they can activate the Stroke Code Team

Prehospital stroke screening tools

• **CPSS** Cincinnati Prehospital Stroke Scale - most commonly used tool. The healthcare provider can evaluate the patient in less than 1 minute. A possible stroke of 72% if 1 of the 3 findings is present.
• **LAPSS** Los Angeles Prehospital Stroke Scale – examines unilateral deficit facial paresis, arm drift and hand grip weakness.

Criteria in Screening

• The patient is 45 years of age and older
• With no history of epilepsy or seizure
• The patient is not using a wheelchair or not bedridden at baseline
• Blood glucose is between 60-400 mg/dl
• With unilateral weakness of any of the following: facial smile, hand grip, arm strength
• **MASS** Melbourne Ambulance Stroke Screen
• **MENDS** Miami Emergency Neurologic Deficit Score
• **ROSIER** Recognition of Stroke in the Emergency Room Score

Table 9.2 The Cincinnati Prehospital Stroke

Assessment	Result			
	Normal		Abnormal	
Facial droop Ask the patient to grin (smile with teeth)	The face moves equally on both sides		One side of the face is unequal	
Arm drift Ask the patient to extend both arms straightly as he closes his eyes	The arms move equally		One arm drift down or doesn't move at all	
Speech Let the patient say "you can't teach an old dog new tricks"	Patient speaks clearly without slurring		Patient cannot speak or is having difficulty in speaking and uses the wrong words.	
Time to call				

ED Assessment and Management

- Activate the Stroke Team after receiving notification from EMS
- Prepare patient for a brain CT scan or MRI
- Receive patient from the EMS Team
- Support ABCs's: Airway, breathing, and circulation
- Provide supplemental oxygen
- Take the vital signs
- Establish IV line and do blood investigations
- Conduct complete physical and neurological assessment
- Check glucose level
- Evaluate the patient's medical history including previous hospitalization and any medical procedure, use of medications
- Establish the time the patient was last seen normal

Note: The best practice is to go directly to the Brain Imaging suite rather than going to the ER

Table 9.3 Stroke Care Time Frame (Hospital Arrival)

Time	Intervention/Treatment
10 min.	General Assessment (Physical and Neurological)
20 min.	Neurological assessment by the stroke team/MRI or CT can go directly to the suite
20 min.	Acquisition of Non- contrast CT/MRI of the head
45 min.	MRI/CT scan interpretation
60 min.	Fibrinolytic therapy

• Within 3- 4.5 hours from the time of symptom onset– administration of fibrinolytic therapy to selected patients
• Up to 24 hours from the time of symptom onset- endovascular therapy for patients with large vessel occlusion (LVO)
• 3 hours: Admission to stroke unit

1a. Level of Consciousness	0	Alert; keenly responsive
	1	Not alert, but arousable by minor stimulation
	2	Not alert; requires repeated stimulation
	3	Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0	Both answers correctly
	1	Answers 1 question correctly
	2	Answers 2 questions correctly
1c. Level of consciousness commands: Open and close your eyes Grip and release your hand	0	Performs both tasks correctly
	1	Perform 1 task correctly
	2	Perform neither task correctly
2. Best Gaze	0	Normal
	1	Partial gaze palsy
	2	Forced deviation
3. Visual	0	No visual loss
	1	Partial hemianopia
	2	Complete hemianopia
	3	Bilateral hemianopia

4. Facial Palsy	0	Normal symmetric movements
	1	Minor paralysis
	2	Partial paralysis
	3	Complete paralysis of 1 or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0	No drift
	1	Drift
	2	Some efforts against gravity
	3	No efforts against gravity; limb falls
	4	No movement
6. Motor Leg 6a. Left leg 6b. Right leg	0	No drift
	1	Drift
	2	Some efforts against gravity
	3	No efforts against gravity; limb falls
	4	No movement
7. Limb ataxia	0	Absent
	1	Present in 1 limb
	2	Present in 2 limbs
8. Sensory	0	Normal; no sensory loss
	1	Mild to moderate sensory loss
	2	Severe to total sensory loss
9. Best language	0	No aphasia; normal
	1	Mild to moderate aphasia
	2	Severe aphasia
	3	Mute; global aphasia
10. Dysarthria	0	Normal
	1	Mild to moderate dysarthria
	2	Severe dysarthria
11. Extinction and attention	0	No abnormality
	1	Visual, tactile. Auditory, spatial, or personal inattention
	2	Profound hemi inattention or extinction
Total score = 0-42		

Table 9.5 NIH Stroke Scale Score

NIH Stroke Scale Score	Stroke Severity
0	No Stroke Symptoms
1-4	Minor Stroke
5-15	Moderate Stroke
16-20	Moderate to Severe Stroke
21-42	Severe Stroke

Table 9.6 Los Angeles Motor Scale (LAMS)

Los Angeles Motor Scale (LAMS)		
Face	0	Both sides move normally
	1	1 side is weak or flaccid
Arm	0	Both sides move normally
	1	1 side is weak or flaccid
	2	1 side is flaccid/doesn't move
Grip	0	Both sides move normally
	1	1 side is weak or flaccid
	2	1 side is flaccid/doesn't move
Total 5		
If the score is > 4 LVO positive (Large Vessel Occlusion) If the score is 4-5 ELVO positive (Emergent Large Vessel Occlusion)		

Result of the Brain Imaging (CT/MRI)

The interpretation of the NCCT/MRI is crucial to identify whether it is an ischemic or hemorrhagic stroke. Additional imaging such as CT angiography and CT perfusion can be done and interpreted by a skilled physician to determine the appropriate treatment.

• Ischemic: No hemorrhage and other abnormalities.
May be eligible for fibrinolytic therapy
• Hemorrhagic: With bleeding(hemorrhage)
Not eligible for fibrinolytic therapy.
Provide initial intracerebral hemorrhage care, and transfer rapidly to a facility with neurocritical and neurosurgical capabilities.

Ischemic Stroke Treatment/Management

Medical Management

1. Fibrinolytic Therapy

Patients with ischemic stroke could be treated with rtPA (recombinant tissue plasminogen activator) alteplase within 3 hours and extended window to 4.5 hours for selected patients after symptoms onset.

Table 9.7 Fibrinolytic Eligibility Criteria

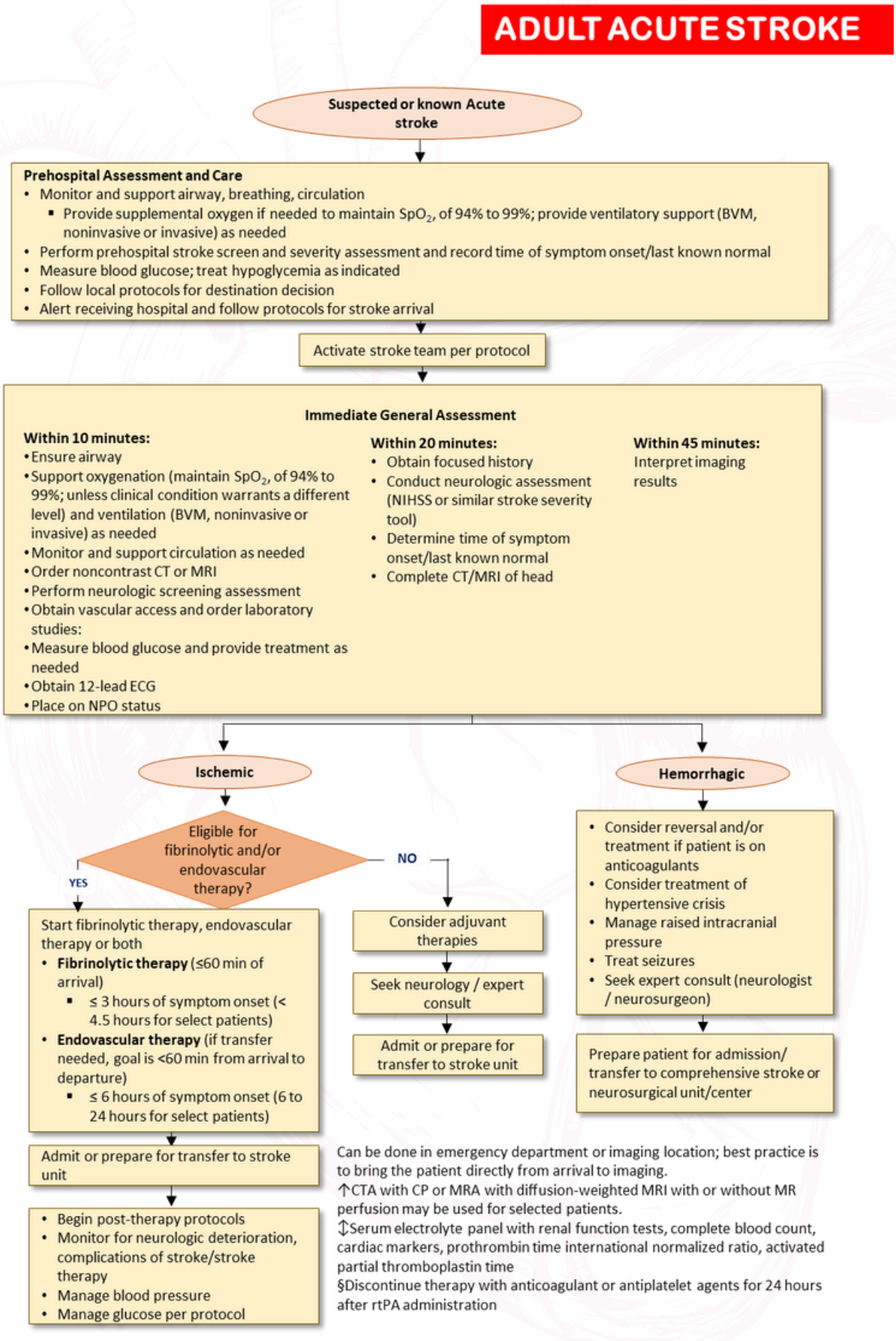
Fibrinolytic Eligibility	
Within 3-4.5 Hours of Symptoms Onset	
Recommended to patients	**Not Recommended to patients**
≥18 years old	With acute intracranial hemorrhage as revealed in the CT scan
≤80 or >80 years old	With symptoms of subarachnoid hemorrhage
With severe stroke	Old ischemic stroke within 3 months
With mild but disabling stroke	With spinal/intracranial surgery within 3 months
With BP of systolic<185mm Hg or diastolic of >110mm Hg	With a history of intracranial hemorrhage
Awakes with symptoms or have an unsure time of onset	Severe head trauma within 3 months
Who display early improvement but remain impaired and disabled.	With blood clotting impairment Platelet count <100,000/mm3 Recent Low molecular weight heparin treatment (within 24 hours) Current use of anticoagulant and thrombin inhibitors
	With gastrointestinal bleeding within 21 days

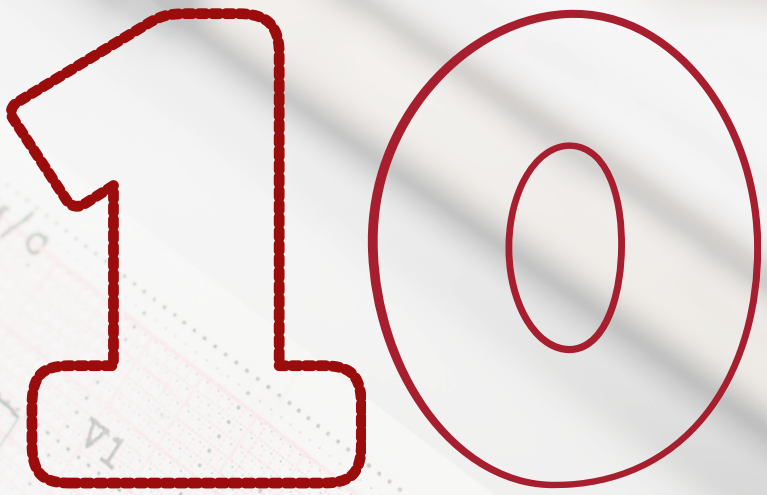
2. Mechanical Thrombectomy Is an endovascular therapy that uses a stent retriever device to remove the blood clot that is causing the stroke in selected patients with large vessel occlusion This can be done up to 24 hours after symptoms onset. Candidates must be transported immediately to a Cath lab or EVT-capable center and be treated right away.

Table 9:8 Stroke Care Facilities

Hospital Facility		Level of Care
ASRH	Acute Stroke Ready Hospital	Assess, stabilize, and provide patients with IV thrombolytics Transfer patient later to PSC, CSC, TSC
PSC	Primary Stroke Center	The most common type of stroke center Assess, stabilize, and provide IV thrombolytics Admits patient to stroke unit
CSC	Comprehensive Stroke Center	Manages all types of stroke including severities Availability of specialty care such as neurology, critical care, & neurosurgical personnel & infrastructure
TSC	Thrombectomy-Capable Stroke Center	Provide mechanical thrombectomy (MT) for stroke patients with large vessel occlusion (LVO) Same high-quality standards as PSC.

Algorithm 9.2 Adult Acute Stroke





CHAPTER

Advanced Life Support
Arrhythmias and Cardiac Arrest

Chapter 10

Advanced Life Support Arrhythmias and Cardiac Arrest

Learning Objectives

At the end of this chapter you will be able to learn:

- Recognize Tachycardia arrhythmias.
- Recognize Bradycardia arrhythmias.
- How to identify if the patient is stable, or unstable.
- How to manage and intervene with patients who are experiencing arrhythmias.

Introduction

Arrhythmia refers to any heart rhythm or rate that is not a normal sinus rhythm. These arrhythmias are frequently associated with a physically normal heart but have an intrinsic impairment of electrical cardiac conduction.

Arrhythmias can be caused by structural heart problems (defects, inflammation, myopathy, etc) or external stimuli (electrolyte abnormalities, hypoxia, acidosis, etc).

Common Causes of Cardiac Arrhythmias:

- Congenital heart defects.
- Cardiopulmonary bypass or cardiac surgery
- Cardiomyopathy.
- Cardiac tumors.
- Inflammatory heart conditions (e.g., Kawasaki disease, myocarditis).
- Pulmonary hypertension.
- Electrolyte imbalances (potassium, magnesium, or calcium).
- Metabolic and respiratory acidosis.
- Hypoxia.
- Hypotension.
- Toxins
- Medications (e.g., vasoactive agents, digoxin, etc.)

Arrhythmias can be categorized based on the heart rate for ease of examination (i.e., too slow or too
fast)

This chapter will discuss the following rhythms:

Tachycardia

- Sinus Tachycardia.
- Atrial fibrillation.
- Atrial fibrillation with RVR.
- Atrial Flutter.
- Supraventricular tachycardia (SVT).
- Ventricular tachycardia.
- Torsade de pointe.

Bradycardia

- Sinus bradycardia.
- 1st Degree AV Heart Block.
- 2nd Degree AV Heart Block Type 1.
- 2nd Degree AV Heart Block Type 2.
- 3rd Degree AV Heart Block.
- Idioventricular Rhythm.
- Junctional Rhythm.

Cardiac Arrest Rhythm

- Asystole.
- Pulseless Electrical Activity.
- Pulseless Ventricular Tachycardia.
- Ventricular Fibrillation.

Recognizing a patient with a cardiac arrhythmia includes prompt assessment , diagnosis, and treatment. Rapid assessment and intervention can prevent hemodynamic instability, which may progress to shock, heart failure, or cardiac arrest if left untreated.

NOTE: Identify any possible reversible causes of the arrhythmia so that they can be addressed during
treatment.

Tachycardia

Tachycardia is described as a heart rate that is higher than 100 beats per minute.

Causes of Tachycardia:

- Vigorous physical activity
- Anxiety
- Pain
- Infection and fever
- Tissue hypoxia
- Hypovolemia (caused by fluid or blood loss)
- Anemia
- Shock
- Congestive heart failure/heart disease
- Medications (e.g., catecholamines)
- Illicit drugs (primarily stimulants)
- Pulmonary embolism
- Tension pneumothorax
- Pericardial tamponade

Sinus Tachycardia:

Is a rhythm at a rate of more than 100 bpm but still follows the normal electrical path where electrical stimuli are initiated in the SA node, and are then conducted through the AV node and bundle of His,bundle branches and Purkinje fibers. A racing heart, palpitations, shortness of breath, or light-headedness may occur in some patients. Treatment should focus on the underlying cause rather than the symptom (e.g. fluid resuscitation for hypovolemia, analgesia for pain, pericardiocentesis for cardiac tamponade, etc.).

•Normal sinus rhythm: from 50 bpm to 100 bpm (ILCOR)

•*Sinus tachycardia: Above 100 bpm

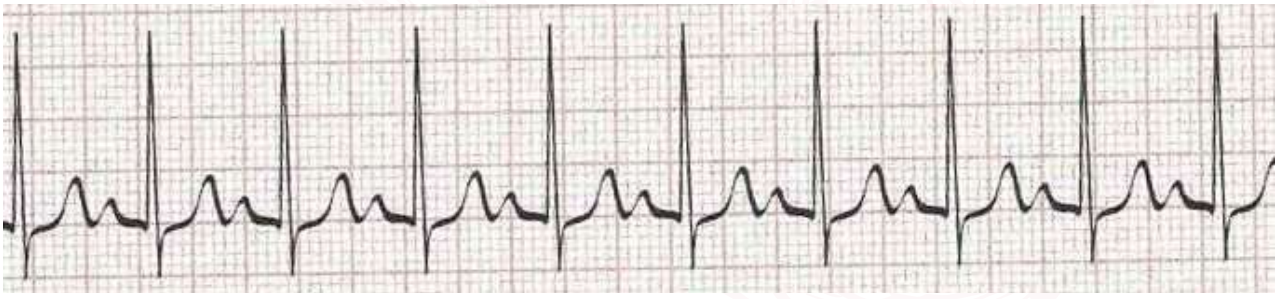


Figure 10.1 Sinus tachycardia

Atrial Fibrillation rhythm: Irregular

Atrial fibrillation (AF) is a cardiac arrhythmia characterized by irregular and rapid electrical activity in the atria of the heart. The ECG criteria for diagnosing AF are irregularly irregular R-R intervals, and the presence of fibrillatory waves.

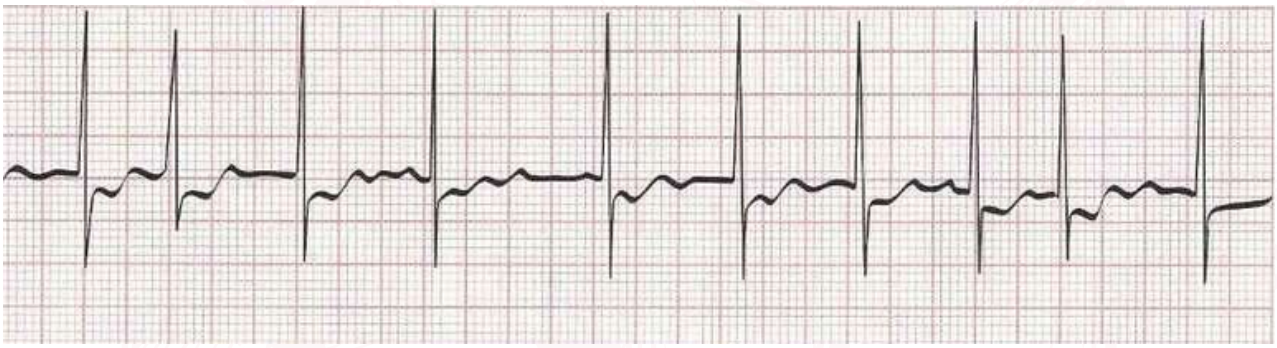


Figure 10.2 Atrial Fibrillation

Atrial Flutter: Irregular or Regular but has sharp waves also called a “Saw-tooth” pattern. It is characterized by a rapid atrial rate of around 250-350 beats per minute. The ECG will show sawtooth-like flutter waves, typically seen in leads II, III, and aVF.

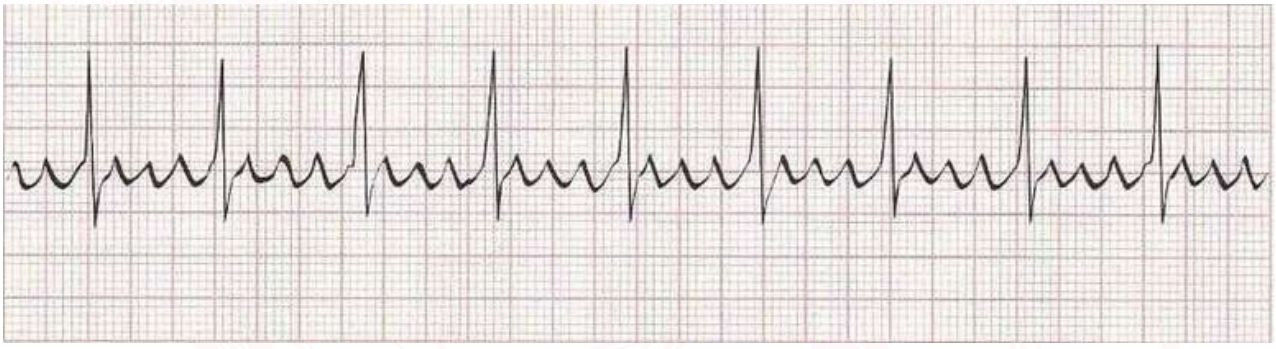


Figure 10.3 Atrial Flutter

Supraventricular tachycardia (SVT)

Refers to a rapid heart rhythm that originates above the ventricles. It is commonly seen on an electrocardiogram (ECG) as a narrow complex tachycardia. The key characteristic of SVT is the absence of any identifiable P waves on the ECG, which distinguishes it from other arrhythmias.

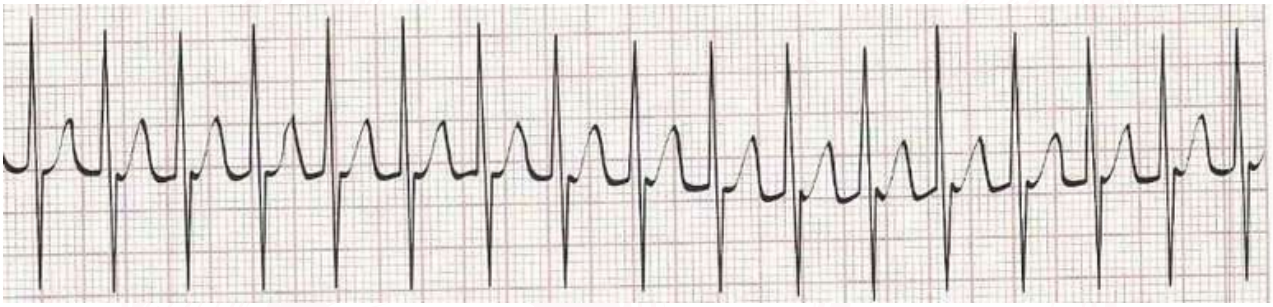


Figure 10.4 Supraventricular tachycardia

Ventricular tachycardia:

Originating in the ventricles at a rate of greater than 100 beats usually more than 150 beats per minute and regular. Lack of P waves and has wide QRS complexes. The QRS complex will be over 0.12 seconds in duration (over three small boxes wide)

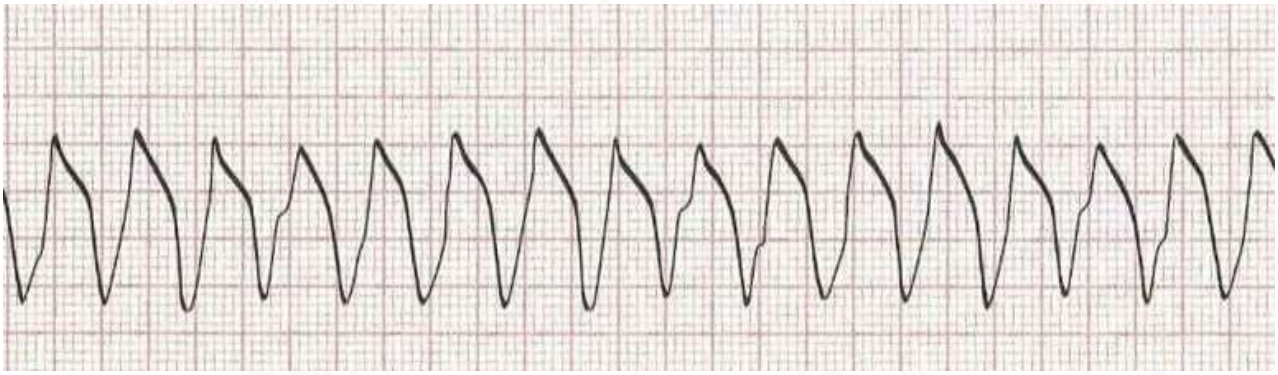


Figure 10.5 Ventricular tachycardia

Torsade De Pointe:

Rapid, irregular QRS complexes, which appear to be twisting around the electrocardiogram (ECG)
baseline.

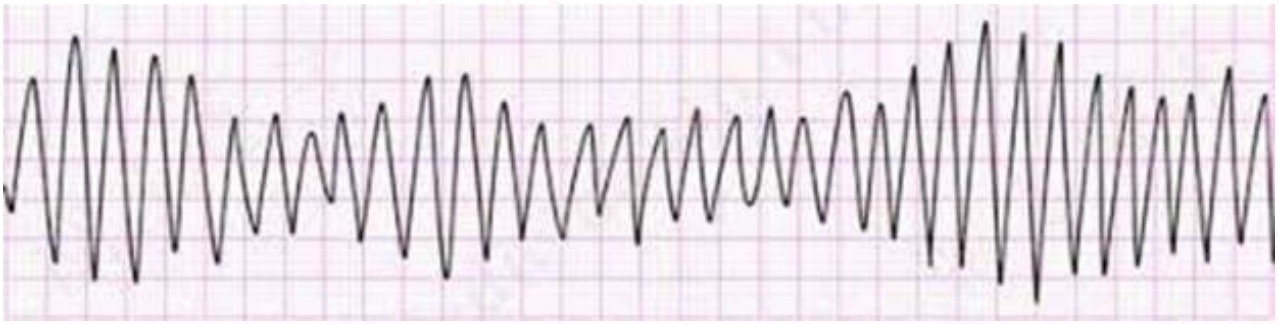


Figure 10.6 Torsade De Pointe

Bradyarrhythmias

Sinus bradycardia:

Is a rhythm at a rate of less than 50 bpm but still follows the normal electrical path where electrical stimuli are initiated in the SA node, and are then conducted through the AV node and bundle of His, bundle branches, and Purkinje fibers.

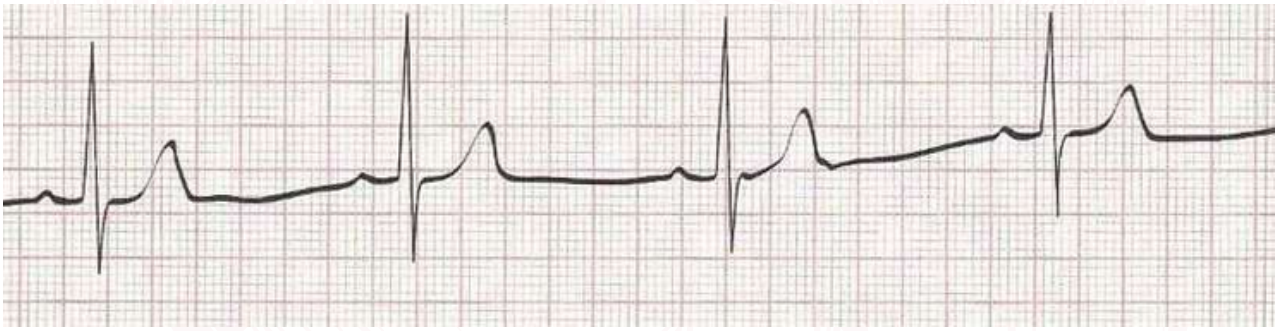


Figure 10.7 Sinus bradycardia

1st Degree AV Heart Block:

The electrical impulse still reaches the ventricles, but moves more slowly than normal through the AV node PR-interval will exceed 0.20s. There is no drop in the QRS and PR interval is exact but prolonged.

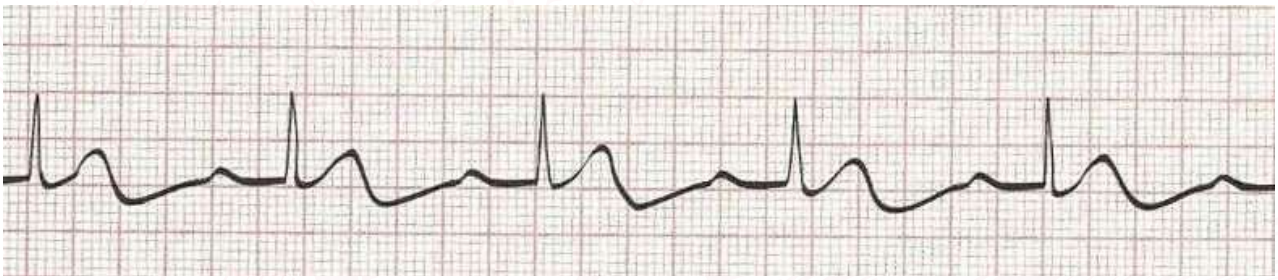


Figure 10.8 1st Degree AV Heart Block

2nd Degree AV Heart Block Type1(Wenckebach or Mobitz type I block):

The PR-interval progressively gets longer until a QRS is dropped and only the p-wave is present. Contains more P waves than QRS.

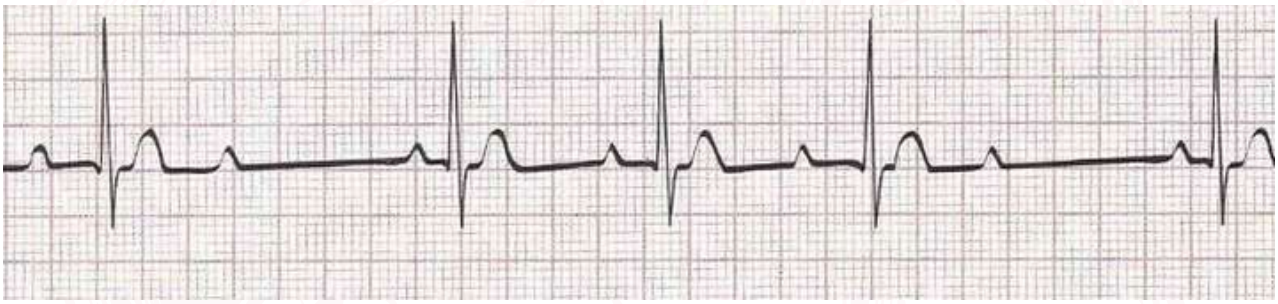


Figure 10.9 2nd Degree AV Heart Block Type 1

2nd Degree AV Heart Block Type 2 (Mobitz type II):

Constant (normal or prolonged) PR interval of all conducted P waves, followed by sudden failure of a P wave to be conducted to the ventricles

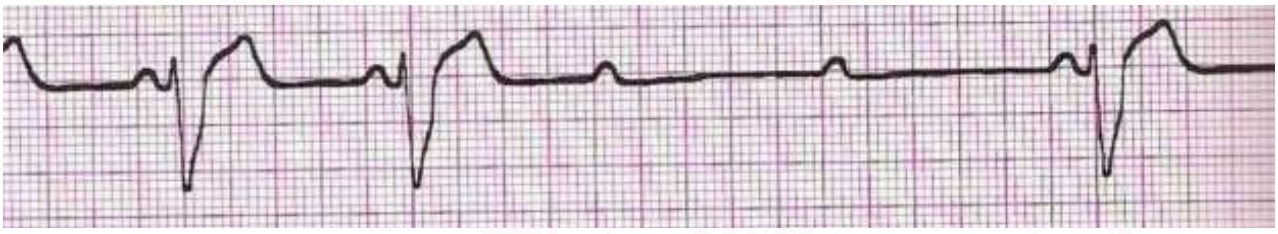


Figure 10.10 2nd Degree AV Heart Block Type 2

3rd Degree AV Heart Block (Complete):

P-waves have no relation to the QRS complexes. P-waves have constant P-P intervals and ride straight through the strip, without any relation to QRS complexes. QRS complexes have constant R-R intervals.

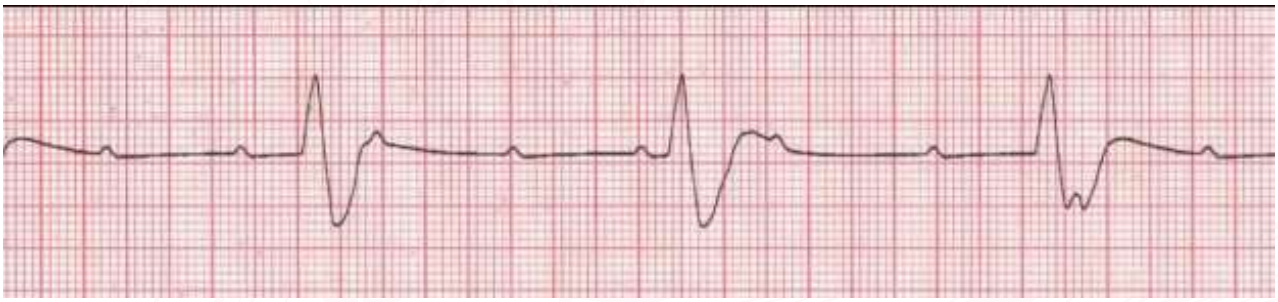


Figure 10.11 3rd Degree AV Heart Block

Idioventricular rhythm:

The inherent rate of a ventricular rhythm is very slow, between 20-40 beats per minute. lack of P waves and the wide QRS complexes. The QRS complex will be over 0.12 seconds in duration (over three small boxes wide).

Figure 10.12 Idioventricular rhythm

Idio-Junctional rhythm: Constant (normal or prolonged) PR interval of all QRS complexes of morphology identical to that of sinus rhythm, but the P waves could be absent, inverted, or after the QRS. This rhythm is slower than the expected sinus rate. Produces a heart rate less than 60 b/m.

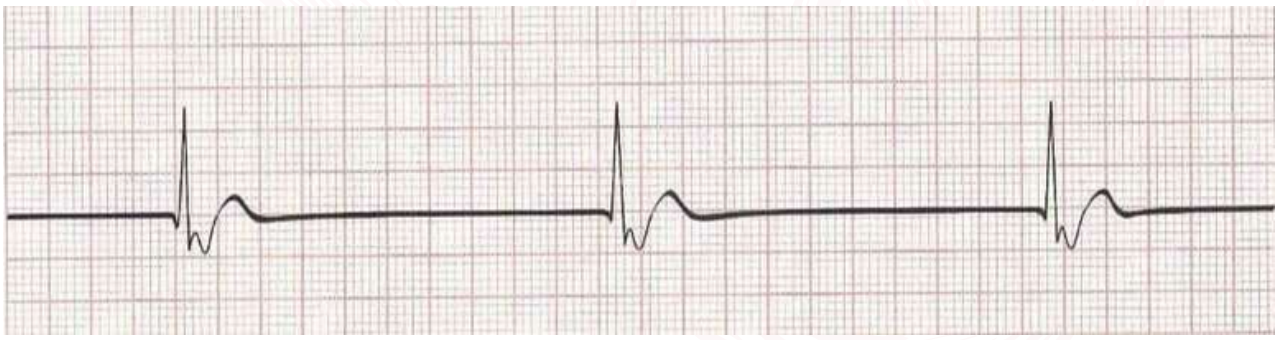


Figure 10.10 2nd Degree AV Heart Block Type 2

Cardiac Arrest rhythms

Asysole rhythm:

Is characterized by the absence of any electrical activity in the heart. This means that there is no contraction or movement of the heart muscles, resulting in a complete cessation of blood flow throughout the body.

Figure

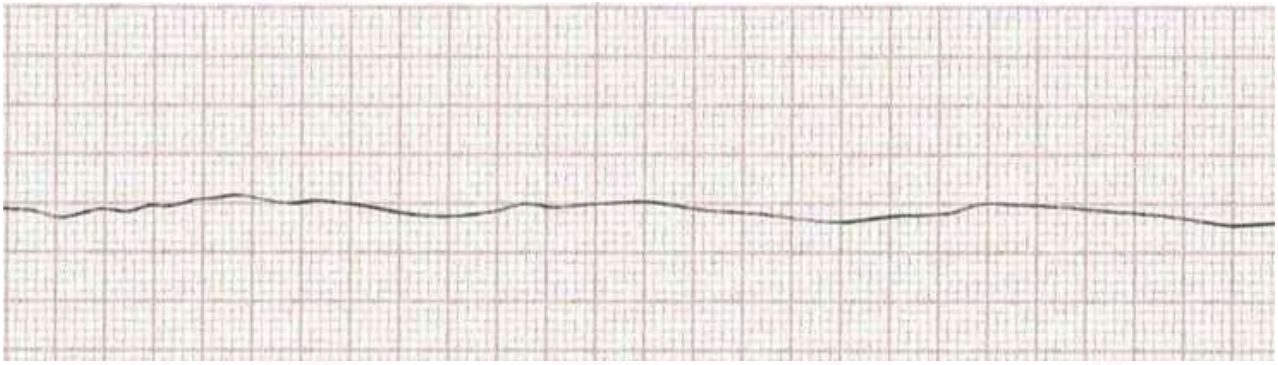


Figure 10.14 Asystole rhythm

Pulseless Electrical Activity:

This is a condition in which the heart's electrical activity is present on an electrocardiogram (ECG), but there is no detectable pulse or blood flow. This phenomenon occurs when the electrical signals in the heart are not strong enough to produce a contraction of the heart muscle, leading to the absence of a pulse. Could be identified with any electrical activity that was supposed to generate a pulse, but it failed except pulseless ventricular tachycardia (PVT).

Pulseless Ventricular Tachycardia:

Pulseless ventricular tachycardia, also known as VT without a pulse, is a shockable cardiac arrest rhythm characterized by a rapid but regular ventricular rhythm.

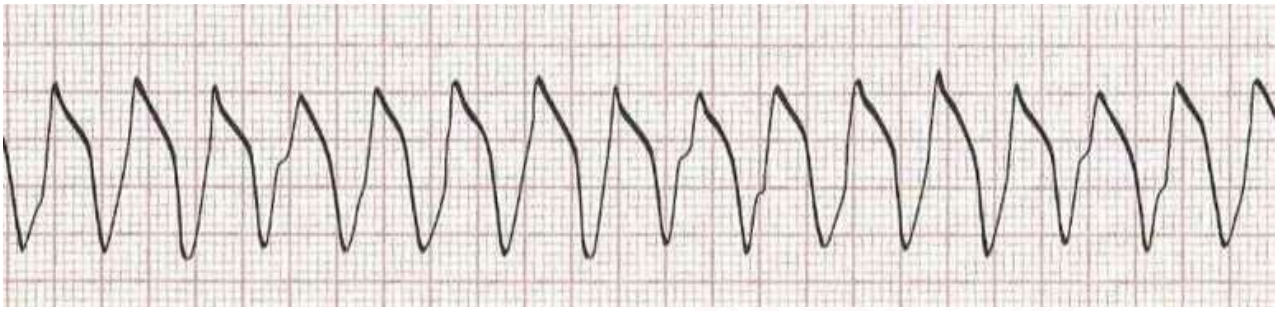


Figure 10.15 Pulseless Ventricular Tachycardia

Ventricular Fibrillation:

Is a shockable cardiac arrest rhythm characterized by rapid, irregular, and chaotic electrical activity in the ventricles.

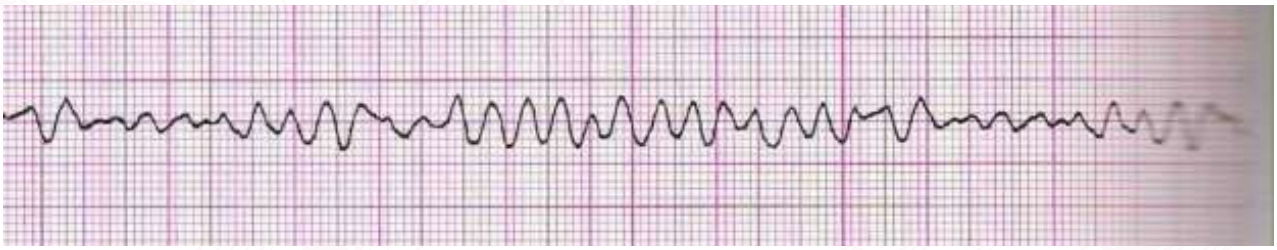


Figure 10.16 Ventricular Fibrillation

Heart Arrhythmias Management:

First the condition of the patient must be identified if the patient is stable or unstable. By assessing the patient's mental status, healthcare professionals can determine if the patient is alert, oriented, and able to respond appropriately. Ischemic chest pain, characterized by a squeezing or pressure sensation in the chest, can indicate an unstable condition and should be promptly addressed. Signs of shock, such as low blood pressure, rapid heart rate, and pale skin, may suggest a critical condition. Additionally, signs of heart failure, such as shortness of breath and fluid retention, can also indicate an unstable patient. Hypotension, or low systolic blood pressure than 90, is another important factor to consider in determining the stability of the patient. If any was found, then the patient is unstable.

General intervention:

- Primary assessment.
- Obtain IV access.
- Maintain a patent airway and oxygen level.
- ECG to identify the heart’s rhythm and 12 leads.
- Obtain full vitals.

Stable Bradycardia management:

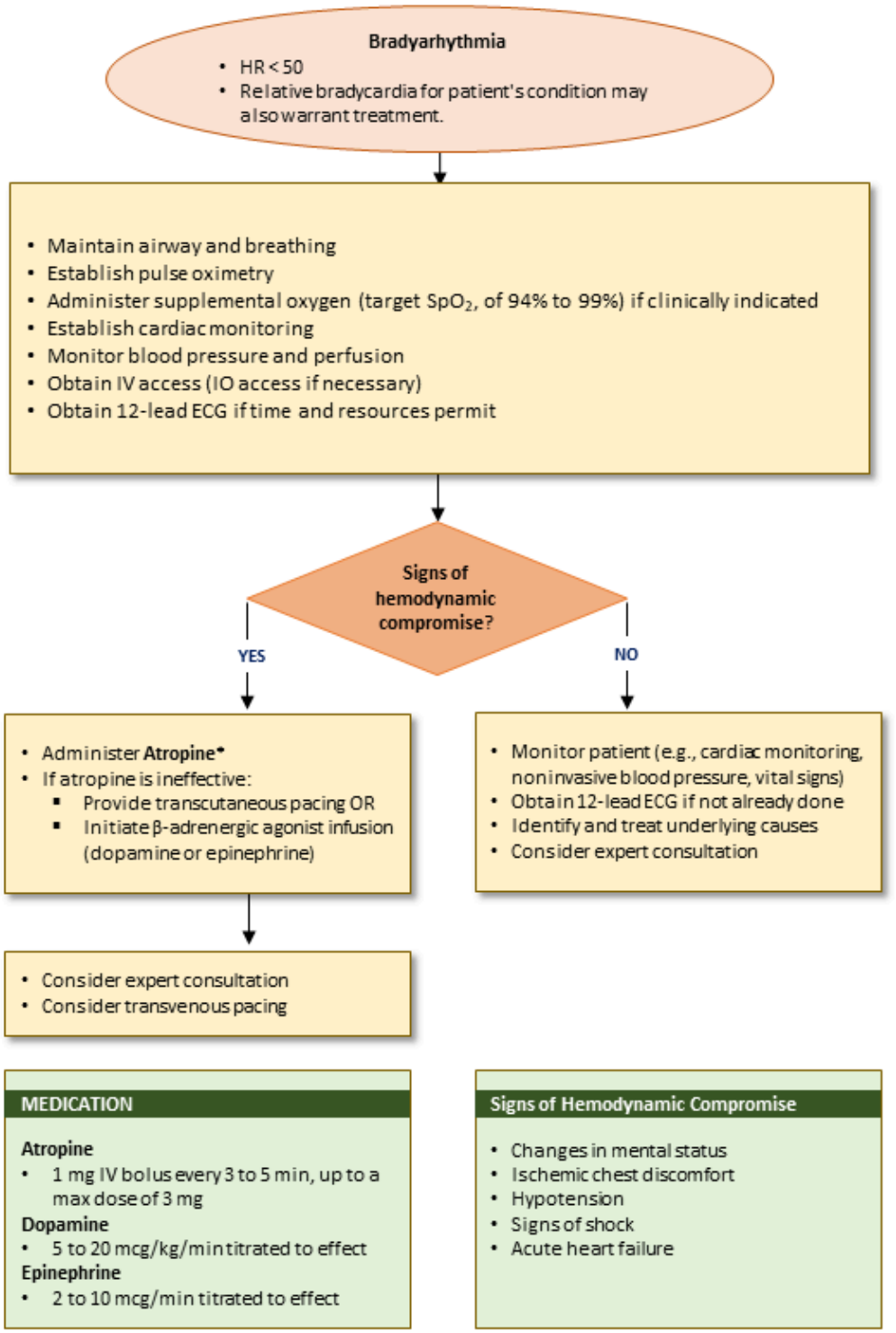
• Monitor and treat the underlying cause.

• Expert consultation

Unstable Bradycardia management:

1. Atropine 1 mg may repeat if recurrence of bradycardia (3 times/ maximum dose 3 mg). If atropine was not effective or a high degree AV block is present (Second or Third) move to number 2 OR 3.
2. Transcutaneous pacing (TCP) if not available move to number 3.
3. B-adrenergic infusion such as dopamine 5-20mcg/kg/min or epinephrine 2-10 mcg/min.

ADULT BRADYARRHYTHMIA



*Consider implementing transcutaneous pacing or -adrenergic agonist therapy immediately for patients with second-degree AV block type I or third-degree AV/ block.
Consider implementing transcutaneous pacing immediately if vascular access is difficult to achieve.

Management of Stable Tachycardia with pulse :

The importance of identifying and classifying different types of tachyarrhythmia's based on their QRS duration and regularity lies in the fact that certain treatments and medications are specifically targeted towards addressing the irregularity in heart rhythms. By determining whether the arrhythmia is regular, irregular, narrow, or wide, healthcare professionals can effectively choose the most appropriate course of action, such as administering beta blockers, calcium channel blockers, or amiodarone, to restore a normal heart rhythm and prevent potential complications.

After identifying if the QRS is narrow (less than 0.12) or wide (greater than 0.12), the next step is to determine if the rhythm is regular or irregular.

For Regular narrow rhythm,

The first step is to attempt vagal maneuvers like Valsalva maneuver (Fig.1) or carotid massage (Fig.2). If this fails to restore normal rhythm, then adenosine 6mg rapid IV push should be administered. If the first dose of adenosine fails, a second dose of 12mg rapid IV push can be given. If adenosine is unsuccessful, the next approach is to initiate beta blocker or calcium channel blocker therapy.

Figure. 10.1 Valsalva maneuver syringe

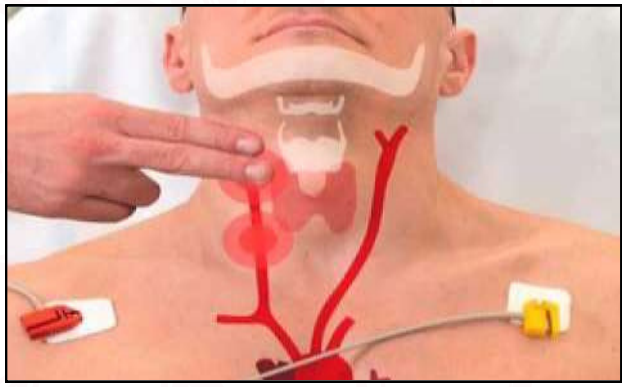


Figure 10.2 (carotid massage)

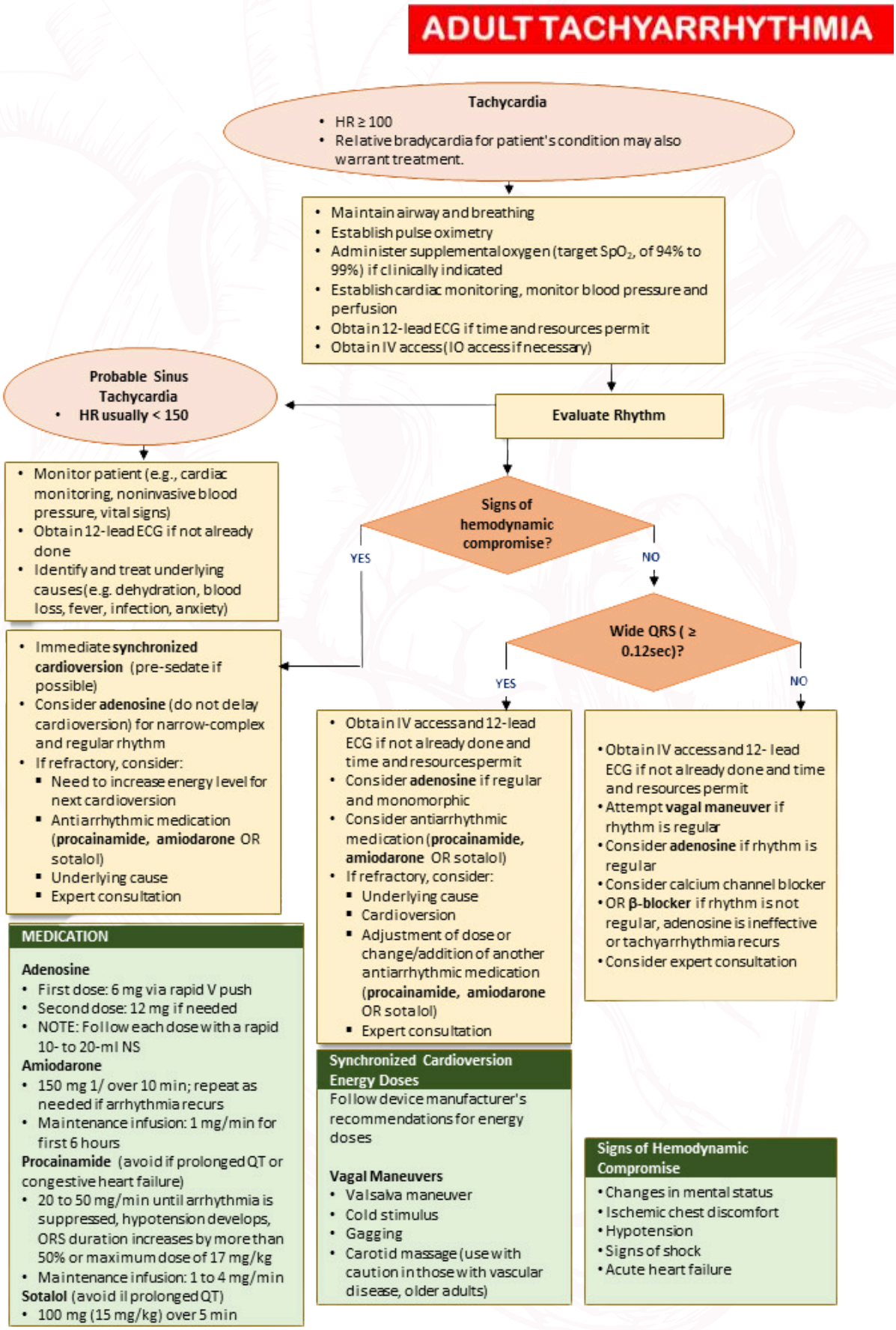
The Valsalva maneuver is a technique that involves forcibly exhaling while keeping the mouth and nose closed. It is often used as an initial treatment for certain types of cardiac arrhythmias, such as supraventricular tachycardia. By increasing intrathoracic pressure, the Valsalva maneuver helps stimulate the vagus nerve, which can slow down the heart rate and restore normal rhythm. While it may not be effective for all types of arrhythmias, it can be a simple and non-invasive option to consider before resorting to medical interventions.

For Irregular narrow rhythm,
Initiate beta blocker or calcium channel blocker therapy.

For Wide regular
An initial 150 mg of amiodarone IV infusion over 10 minutes should be given, maybe repeated if recurs. Followed by a maintenance infusion of 1 mg/min for 6 hours.
Or 100 mg of Sotalol over 5 minutes.
Or Procainamide 20 to 50 mg/min until 17 mg/kg is administered as the maximum dose.
Be cautious if prolonged QT, and avoid Procainamid and Sotalol.

Management of Unstable Tachycardia with pulse :
Immediate Synchronized cardioversion. Energy level for Synchronized cardioversion, should be based on the device's recommendation. Sedation is recommended if it will not delay the cardioversion and only if the patient is conscious.

Algorithm 10.2 Adult Tachyarrhythmia

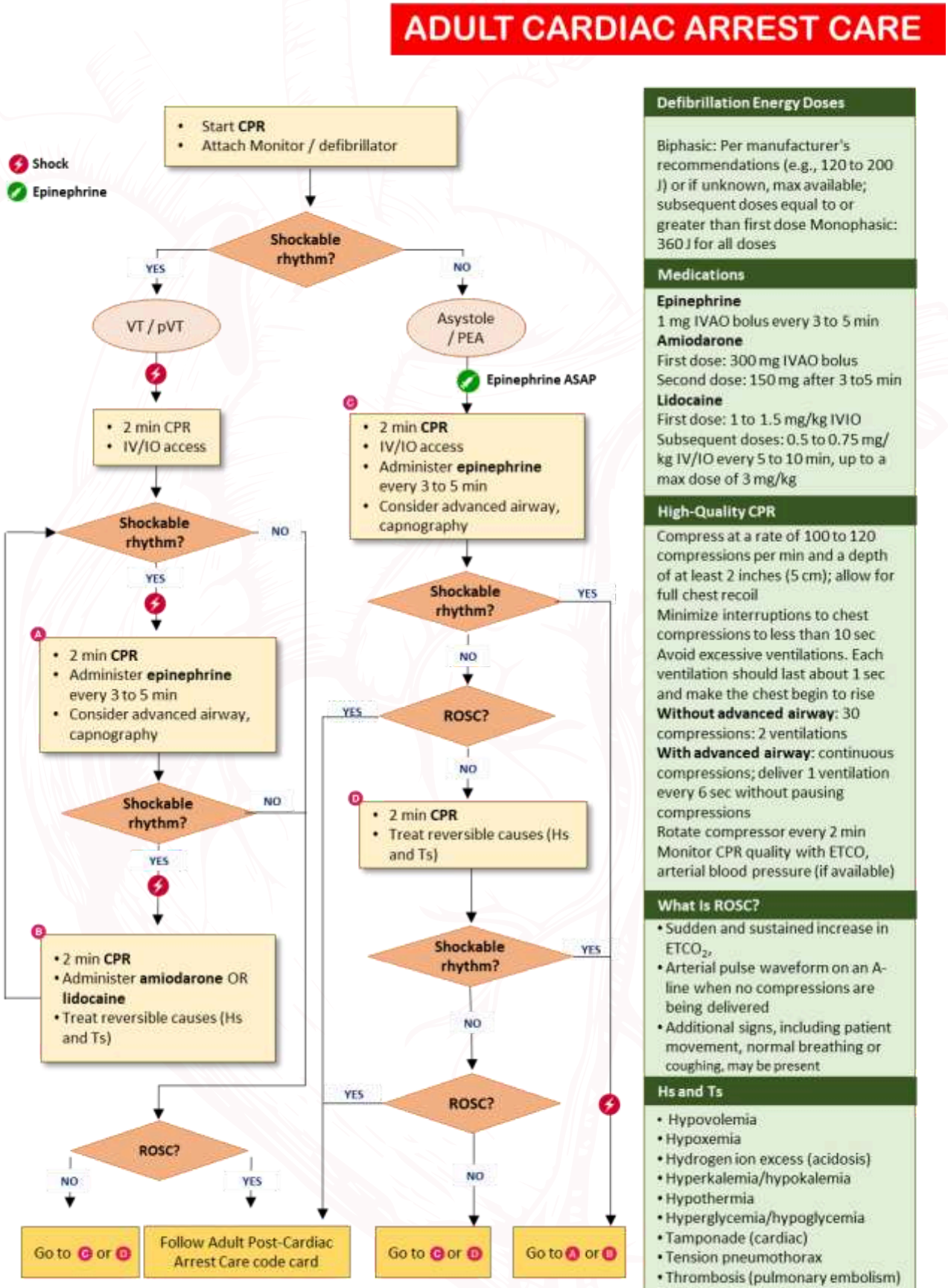


Cardiac Arrest Management:

Cardiac arrest rhythm and treatment can vary depending on the underlying cause of the arrest. In cases of ventricular fibrillation (VF) or pulseless ventricular tachycardia (PVT), immediate defibrillation is necessary to restore a normal heart rhythm. The cycle starts after defibrillation and treatments will be based on how many shocks have been given.For asystole or pulseless electrical activity, cardiopulmonary resuscitation (CPR) is initiated along with administration of medication.

It is crucial for healthcare providers to identify the correct rhythm and initiate the appropriate treatment of the underlying cause quickly to improve the chances of survival.

ALGORITHM 10.3 ADULT CARDIAC ARREST CARE



ACLS IN Special Circumstances

Drowning

The survival rate of cardiac arrest associated with drowning is 13%. The Western Washington Drowning Registry (WWDR) , Drowning victims die from hypoxemia, and the duration and severity of hypoxia are the most important determinants of mortality. Therefore, rescue breathing should be prioritized once the victim is brought ashore (or initiated while in water by trained rescuers).

If the victim is pulseless, chest compressions and BCLS should be administered, and in the absence of obvious signs of death, all drowning victims in cardiac arrest should be evacuated to a hospital, as survival after prolonged submersion, although rare, has been reported.

Unless there is suspicion of spinal injury, routine cervical spine stabilization of drowning victim's delays resuscitation and is not required.

Near-drowning

Victims who are revived at the scene but have required any form of resuscitation after fresh- or salt□water submersion should be transported to a hospital and monitored for 4–6 hours for delayed
decompensation.

Pulmonary embolism

Fulminant pulmonary embolism (PE) (massive PE that results in hemodynamic instability or arrest) is a reversible cause of cardiac arrest, with PEA being the predominant presenting rhythm.

Anticoagulation alone is inadequate for patients with cardiac arrest with confirmed fulminant PE, and systemic thrombolysis or surgical/ percutaneous mechanical embolectomy is required to rapidly reverse pulmonary artery occlusion.

The choice of intervention depends on the timing and available expertise. For patients with cardiac arrest where PE is suspected but not confirmed, evidence suggests that major bleeding risk is not significantly higher in patients undergoing thrombolysis and the risk of death is greater from doing nothing; hence, empirical thrombolysis should be considered.

Extracorporeal cardiopulmonary resuscitation (eCPR) may potentially facilitate the use of fibrinolysis or mechanical or surgical embolectomy and may be considered if expertise is available.

ACLS IN Special Circumstances

Cardiac arrest in pregnancy

The best outcomes for both mother and fetus are achieved through successful maternal resuscitation.

Common causes of cardiac arrest in pregnancy include hemorrhage, eclampsia, amniotic fluid embolism, heart failure, sepsis, aspiration pneumonia, and pulmonary embolism. Standard BCLS and ACLS should be performed with the following special considerations.

Owing to reduced maternal functional respiratory reserves and fetal susceptibility to hypoxia, an advanced airway is required to optimize ventilation and oxygenation. Anticipate the difficult airway owing to anatomical changes in pregnancy.

From 20 weeks' gestation onwards (fundal height at the level of the umbilicus), mothers are prone to hypotension from aortocaval compression, reducing venous return to the heart. This should be countered by continuous left lateral uterine displacement during resuscitation.

During maternal resuscitation, fetal monitoring is not indicated as it distracts from, and interferes with, resuscitative efforts.

Perimortem Cesarean delivery (PMCD) during cardiac arrest for women in the second half of pregnancy is associated with ROSC and improved neonatal survival.

For best outcomes, PMCD should be performed within five minutes of cardiac arrest. Therefore, summoning resources and preparing for PMCD early in the course of resuscitation will allow it to be initiated expeditiously if there is no ROSC within the above time frame.

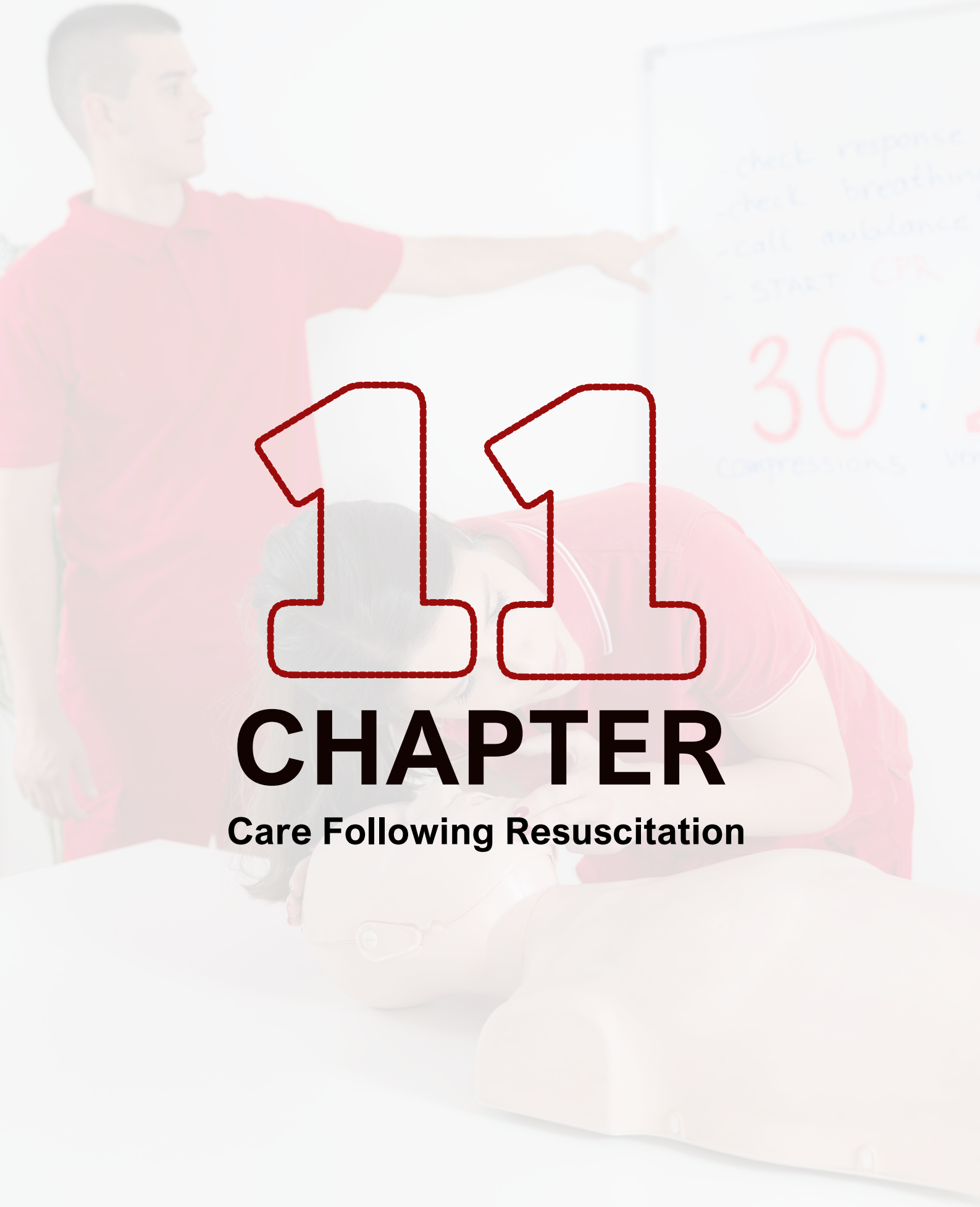
For non-survivable maternal situations, prompt PMCD is associated with improved neonatal survival.

Post-resuscitation care:

a. Previous case series report good maternal survival when ECMO is initiated in maternal cardiac arrest.

b. Temperature Control Protocol is indicated for pregnant patients who remain comatose after ROSC.

A potential complication of temperature control protocol is fetal bradycardia, which requires continuous fetal monitoring and co-management with obstetrics and neonatology.



11 CHAPTER

Care Following Resuscitation

Chapter 11

Care Following Resuscitation

Learning Objectives

At the end of this chapter you will be able to learn:

• Recognize patient experience return of spontaneous circulation (ROSC).

• How to manage and intervene with patients who are experiencing return of spontaneous circulation When there is return of spontaneous circulation (ROSC), post-resuscitation treatment begins. The likelihood of getting ROSC is significantly increased when the underlying arrhythmia: VF or pulseless VT is observed;

• Defibrillation is successful in 2-3 minutes and shouldn't take more than 8 minutes.

• Effective CPR was initiated and continued.

Following cardiac arrest, a thorough care for patients includes:

1. Optimize ventilation and oxygenation by ETT intubation if not yet done and maintain oxygen to a SaO2 of 92–98%.

2. Hemodynamics/Circulation

• Always evaluate the patient's hemodynamic status;

• Regularly check vital signs;

• Periodically report on the patient's progress;

• Immediately report any deterioration or significant changes;

• When resuscitation is prolonged, hypotension is frequently experienced after ROSC.

• Start with an IVF maximum of 2 liters. If hypotension persists, start Dopamine 5-10 mcg/kg/minute.

3. Neurology Status: Determine whether the patient can respond to verbal or unpleasant stimuli. Examine the motor response to look for any motor deficits. If the patient is unresponsive: start Temperature control protocol for 12 to 24 hours, cool the patient to 32 to 37.5 °C, Seizure control, and Maintenance of cerebral perfusion

4. Correct Abnormalities

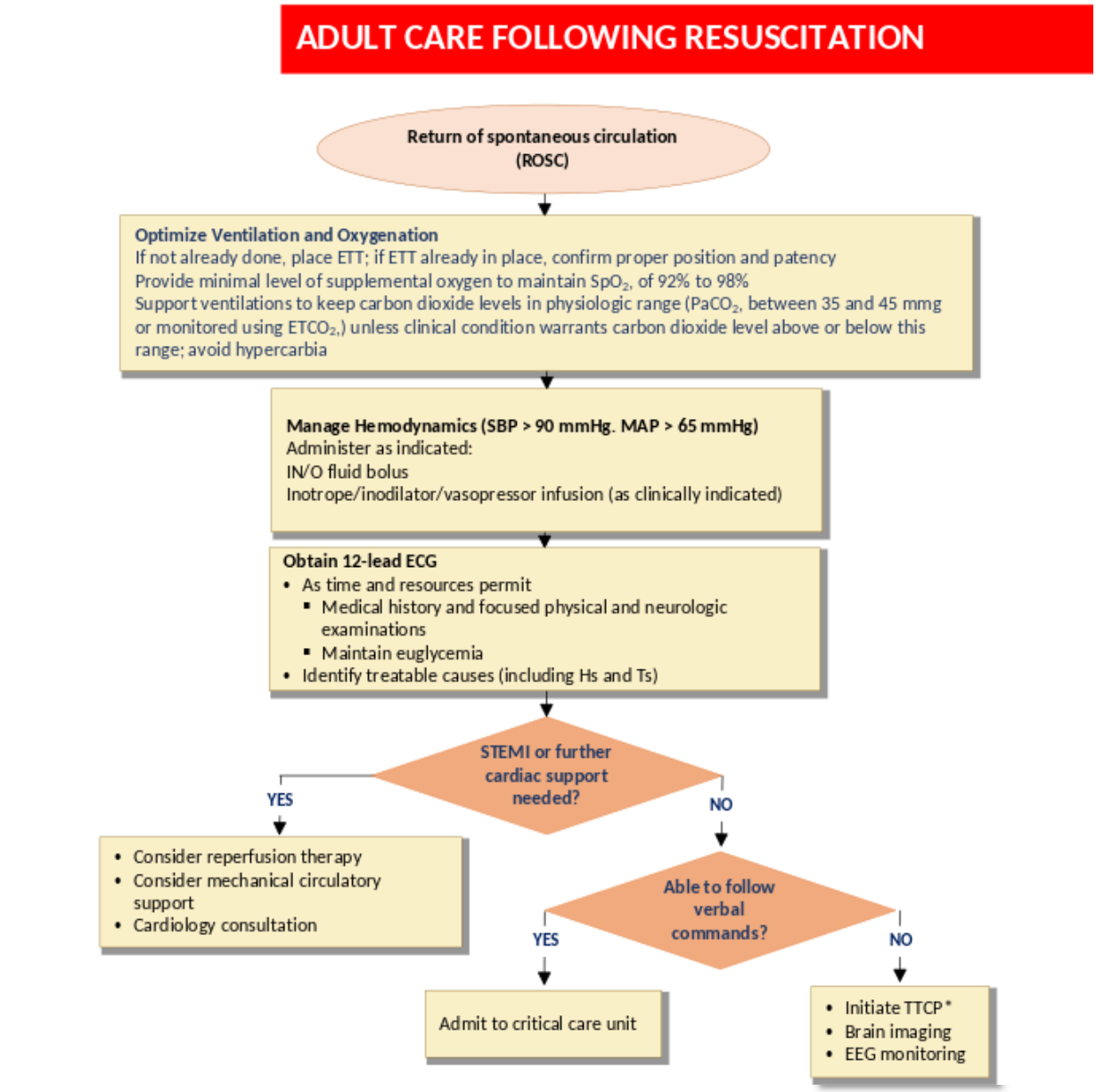
Look for and address underlying conditions that could result in arrest. Electrolyte imbalances, hypoxia, and acidosis are common abnormalities that may need to be treated following an arrest. Correct glucose levels above 10.0 mmol/l and prevent hypoglycemia.

5. Transfer to an Intensive Care Unit (ICU) or Coronary Care Unit (CCU) depends on 12 lead ECG.
If the patient's condition is still critical, make immediate arrangements to transfer the patient to an ICU or CCU.
If the patient's condition is still critical, make sure the patient is stable and transfer-ready before transferring them.

The resuscitation record is a crucial part of any resuscitation effort. It provides documentation of the life support procedures that were carried out. It also enables us to reconstruct the sequence of events with a correlation of interventions and responses during the resuscitation.

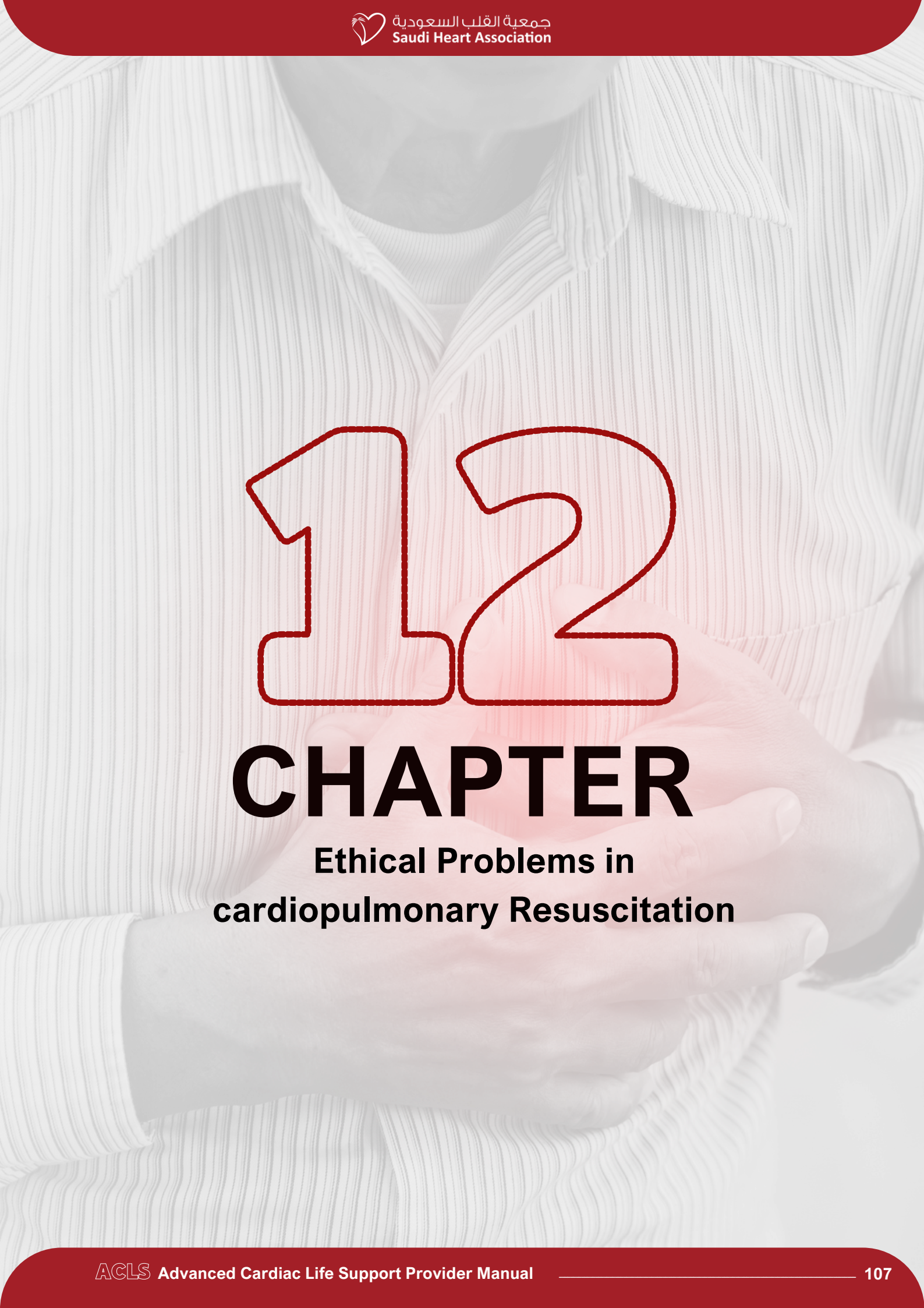
The record also enables us to assess the appropriateness of care and facilities. the prospective gathering of data to assess training outcomes and effects; constant communication with family members

Algorithm 11.1Adult Care Following RESUSCITATION



TTCP: Targeted Temperature Control Protocol

Providers should not initiate TTCP in the prehospital setting. The evidence for TCCP is constantly evolving. Defer to institutional protocols and clinician judgment based on the latest evidence.



12 CHAPTER

Ethical Problems in cardiopulmonary Resuscitation

Chapter 12

Ethical Problems in Cardiopulmonary Resuscitation

Cardiopulmonary Resuscitation Ethical Issues

To save lives, cardiopulmonary resuscitation is used. However, in the majority of cases, CPR is started without taking into account whether it is done against the victim's desires, the intentions of the victim's family, or whether an advanced directive is present.

ethical standards

Healthcare professionals must take ethical, legal, and cultural considerations into account when providing CPR to patients. Knowledge, specific patient or surrogate preferences, as well as regional and regulatory constraints, should all be taken into consideration when deciding whether to start or continue resuscitative efforts.

The choice to perform resuscitation is governed by five key ethical principles:

1) Patient autonomy: Ability to accept or reject treatment. applied to people who are capable of making decisions, unless specifically prohibited by court.

2) Beneficence: Providing a patient with a benefit while weighing the risks and rewards

3) Non-malice: refraining from harm or causing further harm

4) Justice: Fair distribution of scarce medical resources, including access to resuscitation for everyone who will benefit from it given the resources available.

The patient should be treated with decency and honesty. To serve the patient's best interests, disclosure of information must be honest.

Do not attempt Resuscitation (DNAR)

This is a crucial consideration when deciding whether to begin CPR or not. In the United States, it is a legally enforceable document that can be either verbal or written and is based on discussions, written orders, living wills, or a durable power of attorney. It is significant to highlight that written advanced directives are accepted by the court of law more frequently than memories of talks.

In 1988, a fatwa issued by the General Presidency of Scholarly Research and Ifta in Riyadh (Fatwa 12086) established the basis for the DNR order policy in Saudi Arabia. This policy requires three "specialized and trustworthy" physicians to determine the issuance of a DNR order, without consulting the patient's family or legal guardian.

The fatwa specifies six situations for issuing a Do Not Resuscitate (DNR) order: if the patient arrives dead at the hospital, if a panel of physicians certifies that the illness is untreatable and death is imminent, if the patient is medically unfit for resuscitation, if the patient suffers from advanced heart or lung disease or repeated cardiac arrest, if the patient is in a vegetative state, and if resuscitation is deemed pointless.

Local guidelines ensure that a DNR patient receives all treatments except for cardiopulmonary resuscitation (CPR), with a focus on maintaining the patient's comfort and dignity.

In 2017, the Saudi Health Council released the National Policy and Procedure for DO NOT RESUSCITATE (DNR) status, detailing all aspects of DNR orders, including order initiation, decision-making, and validity.

Fundamentals of futility

When an intervention is unlikely to be beneficial to the patient, it is called medical futility. It is also described as when a patient's anticipated quality of life goals or a doctor's physiological goals are not met as a result of an intervention.

In such cases, stopping resuscitation efforts or delaying resuscitation should be taken into consideration. A therapy trial should be taken into consideration if the prognosis is doubtful or uncertain, though, until sufficient data is available to predict the expected clinical course or the likelihood of survival.

Following are instances whereby Resuscitation should be reconsidered:

1) Return of spontaneous circulation as the cue to end CPR
2) Exhaustion
3) Overt indicators of dying
4) A compassionate doctor's choice

When to avoid starting CPR

- The patient's or surrogate decision maker's presence of an Advanced Directive
- A valid DNAR from the attending doctor
- Clear indications of death
- Impairment incompatible with life

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