

Advanced Cardiac Life Support: Tips and Tricks

Advanced Cardiac Life Support (ACLS) is a critical skill set for healthcare professionals who respond to cardiac emergencies. This document provides a comprehensive overview of ACLS concepts, encompassing essential immediate actions, airway management techniques, cardiac rhythm interpretation, pharmacological interventions, defibrillation and cardioversion, and post-cardiac arrest care. This document will be a useful tool for those seeking to enhance their ACLS skills, providing a blend of theoretical knowledge and practical tips to improve patient outcomes in life-threatening situations.



Introduction to ACLS

ACLS is a standardized set of protocols designed to manage cardiovascular emergencies, such as cardiac arrest and other life-threatening arrhythmias. It builds upon the fundamental principles of Basic Life Support (BLS) and equips healthcare providers with advanced skills and knowledge to address complex cardiac events. ACLS emphasizes a systematic approach, encompassing rapid assessment, timely interventions, and continuous monitoring of the patient's vital signs.

The ACLS curriculum encompasses a range of topics, including:

- Recognition and treatment of various cardiac rhythms
- Pharmacological interventions for cardiac emergencies
- Defibrillation and cardioversion techniques
- Airway management and ventilation strategies
- Post-cardiac arrest care, including neurological assessment and monitoring

ACLS training is essential for healthcare professionals who work in emergency settings, such as hospitals, ambulances, and critical care units. It provides them with the skills and knowledge necessary to respond effectively to cardiac emergencies, improving patient survival rates and minimizing long-term neurological damage.



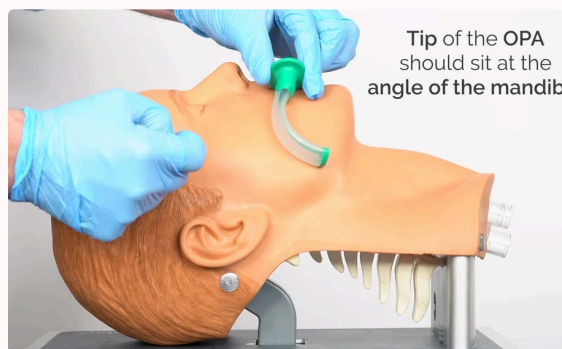
Immediate Actions in a Cardiac Arrest Emergency

Time is critical in a cardiac emergency. The first few minutes are crucial for initiating life-saving interventions. Upon encountering a patient in cardiac arrest, immediate actions should be taken to ensure a favorable outcome. This includes:

- **Assessment and Recognition:** Quickly assess the scene for safety, identify the patient's responsiveness and presence of a pulse, and activate the emergency response system.
- **Chest Compressions:** Immediately begin chest compressions at a rate of **100-120 compressions** per minute, ensuring proper hand placement and depth.
- **Airway Management:** Ensure an open airway by tilting the head back and lifting the chin (head-tilt chin-lift) or using a jaw thrust maneuver.



- head-tilt chin-lift



OPA



- jaw thrust maneuver

- **Ventilations:** Deliver breaths through mouth-to-mouth or mouth-to-mask resuscitation if the patient is not breathing. **1 Breath every 6 Seconds**
- **Defibrillation:** Use an automated external defibrillator (AED) or manual defibrillator to deliver shocks if needed. **70 joules to 200 joules**
- **Early Advanced Life Support:** Immediately request advanced life support personnel for further interventions, such as medication administration and advanced airway management.

These steps represent the initial phases of the ACLS algorithm, aiming to restore circulation and oxygen delivery to the brain, ultimately increasing the chance of patient survival.

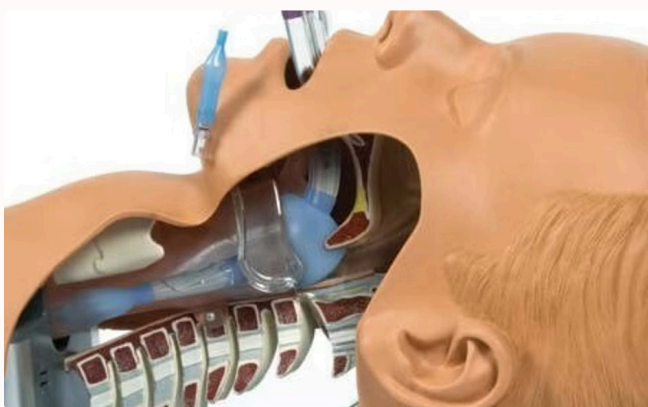
Airway Management Techniques

Maintaining a patent airway is critical for effective oxygenation and ventilation during a cardiac emergency. ACLS providers use various airway management techniques to ensure adequate airflow, ranging from simple maneuvers to more advanced procedures.

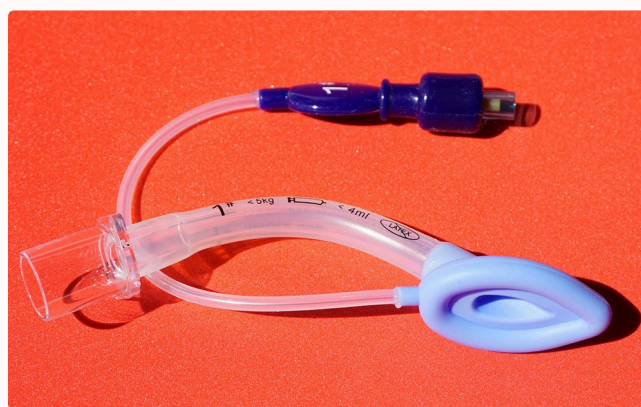
Common airway management techniques include:

- **Head-Tilt Chin-Lift:** A basic maneuver used to open the airway by tilting the head back and lifting the chin.
- **Jaw Thrust:** An alternative maneuver for patients with potential spinal injuries, where the jaw is lifted forward without tilting the head.
- **Oropharyngeal Airway (OPA):** A curved, plastic tube inserted into the mouth to keep the tongue from obstructing the airway.
- **Nasopharyngeal Airway (NPA):** A flexible, plastic tube inserted through the nostril to maintain an open airway.
- **Endotracheal Intubation:** A more advanced procedure where a tube is inserted into the trachea to provide a secure airway.

The selection of an airway management technique depends on the patient's condition, the provider's experience, and the available equipment. Effective airway management ensures adequate oxygen delivery and ventilation, which are crucial for patient survival during cardiac emergencies.



King Tube



LMA



ENDOTRACHEAL TUBE

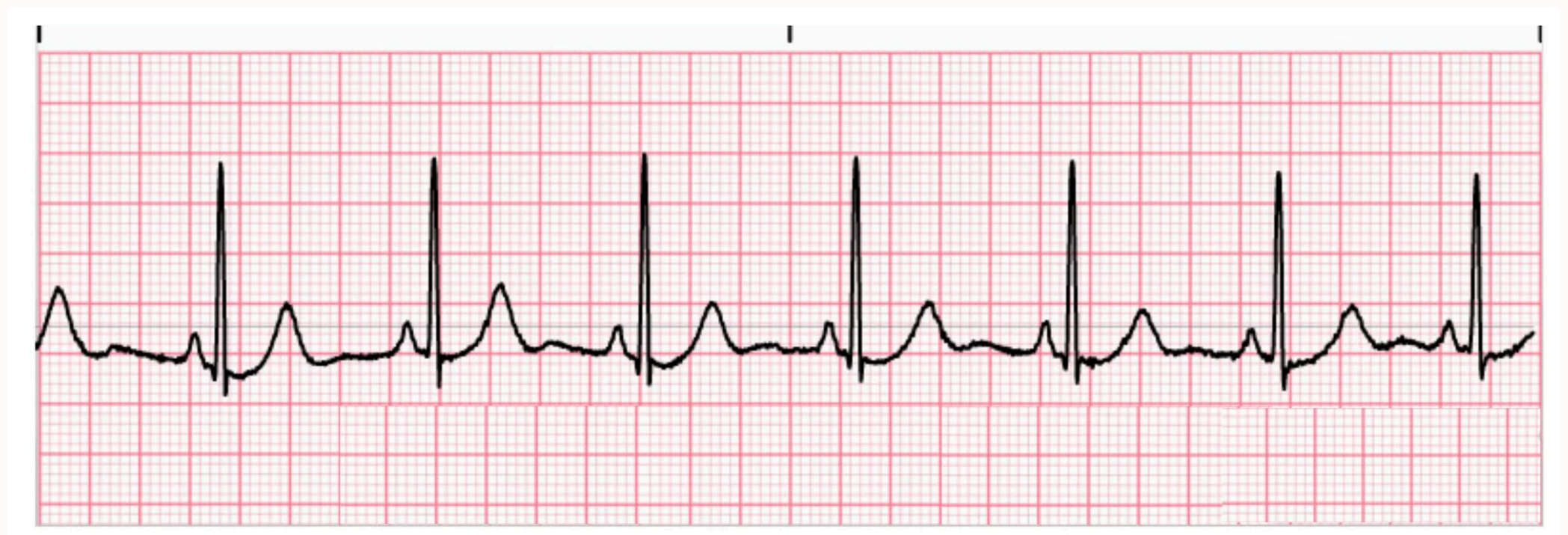
Cardiac Rhythm Interpretation

Accurate interpretation of cardiac rhythms is fundamental to providing effective ACLS care.

Understanding the different rhythm patterns is essential for identifying the underlying cause of the cardiac event and guiding appropriate interventions.

Here are key aspects of cardiac rhythm interpretation:

- **Electrocardiogram (ECG):** The ECG is the primary tool used to visualize the electrical activity of the heart. It provides a graphical representation of the heart's electrical impulses, which can be used to identify various rhythms.
- **Normal Sinus Rhythm (NSR):** This is a regular rhythm originating from the sinoatrial (SA) node with a heart rate between 60-100 beats per minute (bpm).



- **Tachycardias:** Rhythms with a heart rate greater than 100 bpm, including supraventricular tachycardia (SVT), ventricular tachycardia (VT), and atrial fibrillation (AFib).
- **Bradycardias:** Rhythms with a heart rate less than 60 bpm, including sinus bradycardia and heart block.
- **Asystole:** Absence of any electrical activity in the heart.
- **Ventricular Fibrillation (VF):** A chaotic rhythm with no organized electrical activity, resulting in ineffective pumping action of the heart.

Understanding these rhythm patterns is essential for providing appropriate treatment, such as medication administration, defibrillation, or cardioversion. Regular practice and proficiency in ECG interpretation are crucial for successful ACLS management.

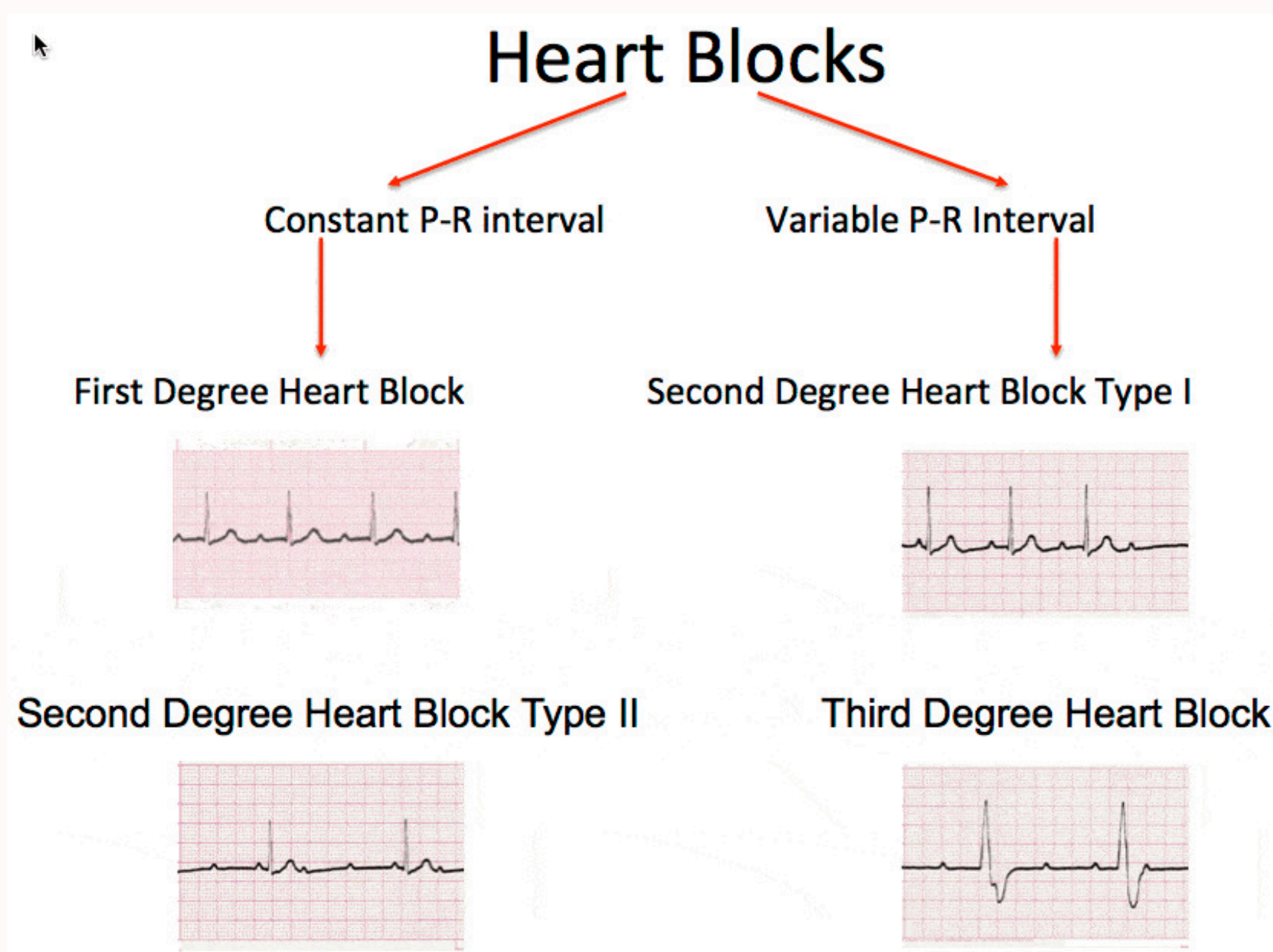
Bradycardias and Heart Blocks

Bradycardias are characterized by a **heart rate of less than 50 beats per minute** (bpm) and typically present with a **systolic blood pressure below 90 mmHg**.

Treatment options include administering **Atropine 1 mg** IVP every 3-5 minutes, up to a maximum dose of 3 mg. If atropine is ineffective, transcutaneous pacing or transvenous pacing may be necessary to increase the heart rate. Additionally, a temporary pacemaker can be inserted into the heart to provide electrical stimulation and restore a normal heart rhythm.

Additionally, heart blocks can occur, which interrupt the electrical conduction through the heart. The types include:

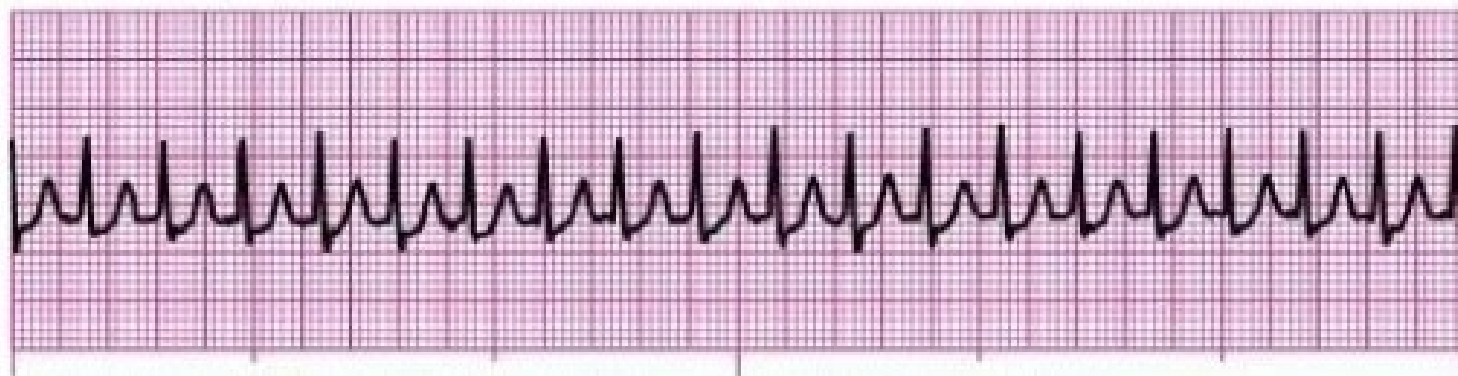
- **Second-degree Type 1 (Wenckebach):** A progressive prolongation of the PR interval until a beat is dropped.
- **Second-degree Type 2:** Intermittent failure of conduction without preceding changes in the PR interval.
- **Third-degree (Complete Block):** No electrical impulses conduct to the ventricles, requiring immediate intervention.



Tachycardias

Supraventricular Tachycardia (SVT)

Supraventricular Tachycardia (SVT) is characterized by an abnormally fast heart rate originating above the ventricles, typically between **150 and 200 beats per minute**. Common causes include reentrant circuits such as atrioventricular nodal reentry, atrial flutter, and atrial fibrillation, as well as factors like stress, caffeine, and underlying heart disease.



Treatment for Stable SVT: Vagal maneuvers, such as the Valsalva maneuver, may be attempted to terminate the arrhythmia. If that fails, **adenosine (6mg Rapid IVP the first dose and 12mg rapid IVP the second dose)** can be administered, followed by beta-blockers or calcium channel blockers as maintenance therapy.

Treatment for Unstable SVT: Immediate synchronized cardioversion is necessary if the patient exhibits signs of instability, such as hypotension, altered mental status, or chest pain. After stabilization, further evaluation and treatment can be provided.

Atrial Fibrillation

Atrial Fibrillation (AF) is a common arrhythmia characterized by rapid and irregular electrical impulses in the atria, leading to ineffective atrial contractions. It is typically associated with risk factors such as advanced age, hypertension, and underlying heart disease.

Treatment for Stable AF include rate control with medications like beta-blockers or calcium channel blockers, rhythm control with antiarrhythmic drugs, or catheter-based ablation procedures to restore normal heart rhythm.

Treatment for Unstable AF involves immediate cardioversion, especially if the patient is experiencing signs of hemodynamic compromise. Pharmacologic agents, such as intravenous amiodarone or ibutilide, may also be used in an attempt to restore normal sinus rhythm. Close monitoring and further evaluation of the underlying cause are integral aspects of managing unstable AF.

Monomorphic VTACH

Stable Monomorphic VTACH

Stable Monomorphic VTACH is characterized by a regular heart rhythm originating from the ventricles, **typically between 100 and 250 beats per minute; Systolic B/P greater than 90 mmhg**

The patient usually remains hemodynamically stable with a pulse and adequate blood pressure.

Treatment includes **administering intravenous lidocaine or amiodarone at the dose of** 150 mg bolus followed by maintenance infusion for lidocaine or 300 mg bolus followed by maintenance infusion for amiodarone.

If the patient remains stable, further evaluation and assessment of the underlying cause should be pursued, as well as consideration of long-term management strategies such as antiarrhythmic medications or catheter ablation. Close monitoring of the patient's heart rhythm and blood pressure is essential during and after treatment. to suppress the ventricular tachycardia and prevent further episodes. In some cases, electrical cardioversion may be necessary if the patient's condition does not respond to medication. Additionally, identifying and addressing the underlying cause of the monomorphic VTACH is crucial for long-term management and prevention of recurrence.

Unstable Monomorphic VTACH

Treatment for unstable monomorphic VTACH aims to quickly restore normal sinus rhythm and prevent further complications.

Immediate synchronized cardioversion at the joules of **100 to 200 is recommended for unstable monomorphic VTACH**. Following successful cardioversion, continuous monitoring of the patient's rhythm and vital signs should be performed to detect any recurrence or adverse effects from the treatment. If the patient remains stable, further steps should be taken to investigate and address the underlying cause of the VTACH episode. is the first-line treatment, as it delivers a timed electrical shock to the heart.

Intravenous medications such as amiodarone or lidocaine may also be used to convert the arrhythmia at the dose of **150 mg IV bolus of amiodarone or 1-1.5 mg/kg IV of lidocaine**.

These medications are effective in terminating monomorphic VTACH and can be administered while the defibrillator is being prepared. Close monitoring of the patient's hemodynamic stability and continuous ECG monitoring is necessary during and after cardioversion to detect any recurrence of ventricular arrhythmias.



Pharmacological Interventions

Pharmacological interventions play a critical role in ACLS, aiming to correct underlying cardiac issues, stabilize the patient's condition, and improve overall outcomes. Medications are used to address specific arrhythmias, enhance cardiac output, and manage other physiological imbalances.

Common pharmacological interventions in ACLS include:

- **Atropine:** Used to treat bradycardia and some types of heart block by increasing the heart rate.

Atropine Dose is typically administered in a dose of **1 mg every 3-5 minutes, up to a maximum of 3 mg**. It can be given intravenously or via an endotracheal tube if intravenous access is unavailable. Close monitoring of the patient's heart rate and rhythm should be done after administration to assess the response to atropine.

- **Epinephrine:** A potent vasoconstrictor that improves blood flow to the heart and increases cardiac output. It is used in cardiac arrest to stimulate the heart and improve chances of resuscitation.

Epinephrine dose is typically administered in a dose of **1 mg every 3-5 minutes** during cardiac arrest. It can be given intravenously or via an endotracheal tube if intravenous access is unavailable. Epinephrine can also be used in other scenarios, such as in the management of anaphylaxis, where the dose may differ.

- **Vasopressin:** A synthetic hormone that can be used as an alternative to epinephrine during cardiac arrest. It also has vasoconstrictive properties.
- **Amiodarone:** A potent antiarrhythmic medication used to treat various tachycardias, including ventricular tachycardia and atrial fibrillation. The typical dose is **150 mg to 300 mg administered intravenously over 10 minutes, followed by a maintenance dose of 1 mg/min for the next 6 hours**. Amiodarone works by prolonging the action potential duration and refractory period of cardiac cells, helping to restore sinus rhythm in arrhythmias. It is important to monitor the patient's thyroid function and liver function while on amiodarone due to its potential side effects.
- **Lidocaine:** Another antiarrhythmic medication used to treat ventricular tachycardia and ventricular fibrillation.
- **Sodium Bicarbonate:** Used to treat acidosis, a condition that can occur during cardiac arrest. It helps to restore the body's acid-base balance.

The choice of medication and dosage are crucial for effective management and should be based on the specific cardiac rhythm, patient condition, and ACLS protocols.

ACLS Drug Cards

AMIODARONE



300 mg first dose
150 mg second Dose

Rapid IVP; May Repeat Second Dose after 3-5 minutes

pV-Tach/V-Fib

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EPINEPHRINE



1 mg
Every 3-5 Min
pV-Tach | V-Fib
PEA | Asystole

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ADENOSINE



6 mg First Dose
12 mg Second Dose
Follow each dose with
20 ml NS Rapid Flush
Stable SVT

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ATROPINE



1 mg
Every 3-5 minutes
Max 3 mg
Symptomatic
Bradycardia

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LIDOCAINE



1-1.5mg/kg first dose
0.5mg-0.75mg second dose
Every 3-5 minutes
3 doses Maximum
pVtach/V-Fib
Stable Vtach

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CALCIUM CHLORIDE



500-1000 mg (5-10 mL of 10% solution) IV/IO, administered slowly over 2-5 minutes.
Used for hyperkalemia, hypocalcemia, and calcium channel blocker toxicity.

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Defibrillation and Cardioversion

Defibrillation and cardioversion are essential ACLS techniques used to terminate life-threatening arrhythmias, such as ventricular fibrillation (VF) and ventricular tachycardia (VT), by delivering an electric shock to the heart. The process involves delivering a synchronized electrical current that depolarizes the heart muscle, allowing it to re-establish a normal rhythm.

The key differences between defibrillation and cardioversion are:

- **Defibrillation:** Used for patients in ventricular fibrillation or pulseless ventricular tachycardia, where the heart is not beating effectively. The shock is delivered without regard to the timing of the cardiac cycle.

The purpose of defibrillation is to stop the chaotic rhythm of the heart and allow it to restart with a normal rhythm. The shock delivered during defibrillation is high-energy and intended to reset the entire electrical system of the heart. It is a critical intervention in cases of cardiac arrest to restore a viable rhythm and potentially save a person's life. **The typical joules to use is between 120 and 200 joules.** However, the specific energy level may vary depending on factors such as the patient's size and the type of defibrillator being used. It is important to apply the appropriate level of energy to maximize the chances of successful defibrillation.

- **Cardioversion:** Used for patients with a rapid heart rate that is causing symptoms, such as palpitations or chest pain. The shock is delivered synchronized with the QRS complex on the ECG to avoid delivering it during the vulnerable portion of the cardiac cycle.

The selection of either defibrillation or cardioversion depends on the patient's specific rhythm and clinical presentation. Successful defibrillation or cardioversion can restore a normal heart rhythm, preventing further cardiac damage and improving survival chances.

Post-Cardiac Arrest Care

Following a cardiac arrest, comprehensive post-arrest care is critical for optimizing patient recovery and minimizing neurological damage. This phase focuses on stabilization, continuous monitoring, and addressing potential complications.

Key aspects of post-cardiac arrest care include:

- **Maintaining Vital Signs:** Continuously monitor the patient's heart rate, blood pressure, oxygen saturation, and temperature.
- **Neurological Assessment:** Regularly assess neurological function using the Glasgow Coma Scale (GCS) to evaluate the patient's level of consciousness, responsiveness, and cognitive function.
- **Airway Management:** Continue to manage the airway, ensuring adequate oxygenation and ventilation.
- **Mechanical Ventilation:** If necessary, provide mechanical ventilation to support breathing.
- **Circulatory Support:** Administer fluids and medications to maintain adequate blood pressure and circulatory function.
- **Hypothermia Therapy:** In some cases, therapeutic hypothermia may be used to reduce brain damage after cardiac arrest. Keep the patient cool at a target temperature of **32-36 degrees Celsius for 24-48 hours**, which has been shown to improve neurological outcomes. During this period, sedation and paralysis may be used to maintain patient comfort and prevent shivering, which can counteract the cooling effects. Close monitoring and rewarming protocols are also important during the transition to normothermia.
- **Continuous Monitoring:** Maintain ongoing monitoring of the patient's cardiac rhythm, blood pressure, and other vital signs.

Post-cardiac arrest care is a multidisciplinary approach that requires close collaboration between nurses, physicians, and other healthcare professionals to provide comprehensive and supportive care.

Conclusion and Key Takeaways

ACLS is an essential skill set for healthcare professionals who manage cardiac emergencies. By understanding the principles, algorithms, and interventions associated with ACLS, providers can effectively respond to life-threatening cardiac events, improving patient outcomes and increasing survival rates.

Key takeaways from this document include:

- The importance of immediate actions in cardiac emergencies, including chest compressions, airway management, and defibrillation.
- The ability to interpret cardiac rhythms accurately, enabling appropriate treatment strategies.
- The use of pharmacological interventions to correct arrhythmias, stabilize the patient, and enhance cardiac output.
- The understanding of defibrillation and cardioversion techniques to terminate life-threatening arrhythmias.
- The importance of post-cardiac arrest care, focusing on stabilization, neurological assessment, and continuous monitoring.

Regular ACLS training, practice, and ongoing education are crucial for maintaining proficiency and ensuring optimal patient care. By mastering the concepts and techniques outlined in this document, healthcare providers can contribute significantly to improving patient survival and minimizing long-term neurological damage in cardiac emergencies.

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