



**Advanced and Basic Certifications**

***CPR, First Aid, ACLS and PALS***

**407-766-7899**

# ACLS

## Study Guide

### Key guidelines recommendations for healthcare professionals:

- Effective teamwork techniques should be learned and practiced regularly.
- Professional rescuers should use quantitative waveform capnography — the monitoring and measuring of carbon dioxide output — to confirm intubation and monitor CPR quality.
- Therapeutic hypothermia, or cooling, should be part of an overall interdisciplinary system of care after resuscitation from cardiac arrest.
- Atropine is no longer recommended for routine use in managing and treating pulseless electrical activity (PEA) or asystole.

### Patient Assessment

In ACLS, the specific treatment of a given dysrhythmia or condition depends on the patient's hemodynamic status. In general, patients can be divided into four categories to determine treatment priorities: **Asymptomatic**, **Symptomatic – Stable**, **Symptomatic – Unstable**, or **Pulseless**. **Asymptomatic** patients do not receive treatment, but should be monitored for changes in condition. Any patient with symptoms (even apparently mild symptoms such as palpitations) should be assessed to determine if they are **Stable** or **Unstable**. Determination of a patient's level of hemodynamic compromise can include several factors, including *General Appearance*, *Level of Consciousness*, and *Vital Signs* (especially systolic Blood Pressure).

- *General Appearance*: The first indication of hemodynamic status comes from a patient's general appearance, including skin signs, level of activity, and work of breathing. If a patient shows signs of compensation (such as pale, cool, or diaphoretic skin) or acute distress, they are unstable.
- *Level of Consciousness*: Interaction with the patient allows the provider to evaluate the patient's level of consciousness, based on the patient's activity, awareness of their surroundings, and ability to provide information. If a patient shows any level of mental deficit, family or friends should be consulted to determine if this state differs from the patient's baseline. If the mental deficit is acute, the patient should be considered unstable.
- *Vital Signs*: Vital signs provide a diagnostic evaluation of the patient. Blood Pressure is the primary indicator. A systolic blood pressure above 90 mm usually indicates that the patient is stable (although the provider should be alert for changes in blood pressure that might indicate an unstable patient even if blood pressure is normal). Other vital signs may be useful, but should not be relied upon exclusively. Pulse Oximetry can be useful, especially if it rises or falls, but providers should remember that various conditions (such as CO<sub>2</sub> poisoning) can mask changes in blood oxygen levels, and that a high O<sub>2</sub> saturation may be present in unstable patients (such as those in shock).

Additionally, **heart rate** is of no use in determining if a patient is stable or unstable – a patient with a heart rate of 80 can be severely unstable, while a patient with a heart rate of 210 can be stable if they are still perfusing well. If a patient's General Appearance, Level of Consciousness, and Vital Signs are all normal, the patient is stable. If possible, treatment should be rendered starting with the least invasive **that is appropriate for that patient's hemodynamic status**.

In ACLS, the preferential treatment for symptomatic but stable patients is generally *Medications*, while the preferential treatment for unstable patients is generally *Electrical Therapy*. Once treatment is rendered, **the provider must reassess the patient**.

- If the patient remains symptomatic, the appropriate treatment (medications or electricity) should be given again depending on the patient's heart rhythm and current hemodynamic status. (Thus, if a patient was stable before, but becomes unstable after administration of a drug, the patient should receive electrical therapy to continue treating the dysrhythmia rather than additional doses of a medication.)
- If a patient's General Appearance indicates that they may be unconscious, you should check for responsiveness.

If the patient is **Unresponsive**, get help (send someone to call 911 and bring back an AED, call a code, etc.). The BLS Algorithm should then be followed *Chest compression, Airway, Breathing (C-A-B)*.

❖ **New science indicates the following order:**

**C-A-B**

1. Check the patient for responsiveness.
  2. Check for no breathing or no normal breathing.
  3. Call for help.
  4. Check the pulse for no longer than 10 seconds.
  5. Give 30 compressions.
  6. Open the airway and give 2 breaths.
  7. Resume compressions.
- 
- If the patient is apneic, and if the patient is pulseless, rescuers should begin CPR.
  - Once you determine that a patient is **Pulseless**, an AED or EKG monitor should be attached as soon as possible.
  - CPR should be continued with minimal interruptions. After each rhythm check, the patient should be Defibrillated if appropriate (for V-Fib and Pulseless V-Tach).
  - Regardless of the heart rhythm, medications should be given as soon as possible after CPR is resumed (the specific medication determined by the patient's exact status and heart rhythm).

# ACLS Algorithm Review

*Always start with the C-A-B & D survey!*

## ACUTE CORONARY SYNDROMES

Algorithm: Acute Coronary Syndromes

*Remember.* Consider **MONA** for patients with suspected ACS (angina or AMI):

**M**orphine

**O**xygen

**N**itroglycerine (contraindicated SBP <90 mm/hg, Inferior wall MI and RT ventricular infarction, and Recent Viagra use).

**A**spirin

*...but in the order Oxygen, Aspirin, Nitro, Morphine.*

## Acute Stroke Case

The identification and initial management of patients with acute stroke fall within the scope of the ACLS provider. The goal of stroke care is to minimize brain injury and maximize the patient's recovery. Early recognition of acute ischemic stroke is important because IV fibrinolytic treatment should be provided as early as possible, generally within 3 hours of onset of symptoms, or within 4.5 hours of onset of symptoms for selected patients. The **8 D's** of Stroke care highlight the major steps in diagnosis and treatment of suspected patient.

- **Detection:** Rapid recognition of stroke
- **Dispatch:** Early activation of EMS by 911
- **Delivery:** Rapid EMS ID, management, and transport.
- **Door:** Appropriate triage to stroke center
- **Data:** Rapid triage, evaluation, and management with in the ED
- **Decision:** Stroke expertise and therapy selection
- **Drug:** Fibrinolytic therapy, intra-arterial strategies
- **Disposition:** Rapid admission to the stroke unit

## BRADYCARDIA

### Algorithm: Bradycardia

*Remember: All Trained Dogs Eat:*

- Atropine 0.5 mg IVP for Sinus Bradycardia & 1°, 2° Type I AV Block.
- Transcutaneous Pacing (preferred for 2° Type II and 3° HB); **do not delay pacing in symptomatic patients** (even those in Sinus Brady or low-degree heart blocks)
- Dopamine 5-10 mcg/kg/min (if patient unresponsive to atropine/pacing)
- Epinephrine drip 2 to 10 mcg/min (if patient unresponsive to atropine/pacing)

*Note:* Atropine is not indicated for 2° Type II & 3° heart blocks – proceed directly to pacing if the patient is symptomatic, although Atropine can be *considered if* pacing is delayed

## TACHYCARDIA

### Algorithm: Tachycardia With Pulses

*Remember:* If the patient is unstable, **go directly to synchronized cardioversion.**

Otherwise:

For **Regular Narrow Complex** Tachycardia (probable SVT)

- Obtain 12-lead ECG; consider expert consultation.
- Attempt vagal maneuvers.
- Adenosine 6 mg rapid IV push. If no conversion, give up to two more doses at 12 mg each.

For **Irregular Narrow Complex** Tachycardia (probable A-Fib)

- Obtain 12-lead ECG; consider expert consultation.
- Control rate with Diltiazem or  $\beta$ -blockers.

For **Regular Wide Complex** Tachycardia (probable V-Tach)

- Obtain 12-lead ECG; consider expert consultation.
- Adenosine 6 mg rapid IV push. If no conversion, give up to two more doses at 12 mg each.
- Convert rhythm using Amiodarone – 150 mg over 10 minutes.
- Elective cardioversion.

### For Irregular Wide Complex Tachycardia

- Obtain 12-lead ECG; consider expert consultation.
- Consider antiarrhythmics.
- If Torsades de pointes, give Magnesium Sulfate – 1 to 2 g over 5-60 minutes.

## VENTRICULAR FIBRILLATION / PULSELESS VENTRICULAR TACHYCARDIA

### Algorithm: Pulseless Arrest – Shockable

*Remember:* Good ACLS starts with good BLS:

- **CPR** – start immediately. (C-A-B) Push hard and push fast.
- **Shock** – analyze rhythm, and shock if in VF/pulseless VT.
- **CPR** – resume CPR immediately after shock delivery. Continue for 5 cycles / 2 minutes.
- **Vasopressor or Epi 1 mg** q 3-5 min (can *replace* 1st or 2nd dose of Epi with 40 units Vasopressin). Give as soon as possible after resuming CPR, circulate with chest compressions.
- **Shock** – analyze rhythm, and shock if in VF/pulseless VT.
- **CPR** – resume CPR immediately after shock delivery. Continue for 5 cycles / 2 minutes.
- **Antiarrhythmic** – Amiodarone 300 mg IV/IO or Lidocaine 1-1.5 mg/kg up to 3 mg/kg.
- Give as soon as possible after resuming CPR, circulate with chest compressions.
- **Shock** – analyze rhythm, and shock if in VF/pulseless VT.
- **CPR** – resume CPR immediately after shock delivery. Continue for 5 cycles / 2 minutes.

**Note: Minimize interruptions to chest compressions – do not check a pulse or evaluate the heart rhythm after a shock.** After each shock, resume CPR immediately and continue for 5 cycles prior to rhythm analysis and possible pulse check. After a second dose of Epinephrine, a second antiarrhythmic dose (Amiodarone 150 mg or Lidocaine 0.5 – 0.75 mg/kg) may be given after the next rhythm check.

## PULSELESS ELECTRICAL ACTIVITY

### Algorithm: Pulseless Arrest – Not Shockable

Remember: **PEA:**

- Possible causes (consider the 6 H's and 5 T's).
- **Epinephrine** 1 mg q 3-5 min (can *replace* 1st or 2nd dose of Epi with 40 units Vasopressin). Give as soon as possible after resuming CPR, circulate with chest compressions.

*Note:* In PEA, the electrical system of the heart is functioning, but there is a problem with the *pump, pipes, or volume* – a mechanical part of the system is not working. You can use the **5 H's and 5 T's** to remember the most common reversible causes of PEA:

**Hypovolemia**

**Hypoxia**

**Hypo-/Hyperkalemia**

**Hypothermia**

**Hydrogen Ion (acidosis)**

**Tamponade, cardiac**

**Toxins**

**Thrombosis coronary**

**Tension Pneumothorax**

**Thrombosis pulmonary**

## ASYSTOLE

### Algorithm: Pulseless Arrest – Not Shockable

Remember: **DEAD:**

- **Determine** whether to initiate resuscitation.
- **Epinephrine** 1 mg q 3-5 min (can *replace* 1st or 2nd dose of Epi with 40 units Vasopressin). Give as soon as possible after resuming CPR, circulate with chest compressions.
- **Differential Diagnosis or Discontinue resuscitation** – Are they still dead? Consider the 5 H's and 5 T's (see above)

## EKG and Electrical Therapy Review

The EKG tracing represents electrical activity through the heart. The **P wave** represents depolarization of the atria; the **QRS complex** represents depolarization of the ventricles; and the **T wave** represents the latter stage of repolarization of the ventricles. The interval from the first deflection of the P wave to the beginning of the QRS complex is the P-R Interval (PRI), and should be between 0.12 and 0.20 seconds. A normal QRS complex has duration of 0.12



seconds or less; a longer duration (*wide QRS*) indicates delayed conduction through the ventricles, often as the result of a ventricular pacemaker focus. The horizontal axis of the EKG strip measures time. Each large box represents 0.20 seconds; each small box represents 0.04 seconds. To obtain a 3-lead EKG tracing, place the white (RA) electrode on the right chest just below the clavicle; the black electrode (LA) on the left chest just below the clavicle; and the Red electrode (LL) laterally on the lower left abdomen. Pacer pads go in the anterior/posterior positions. **Defibrillation pads** go on the upper right chest and lower left abdomen, although on children and other small patients the pads may need to be placed in the middle of the anterior and posterior chests.

## Rhythm Disturbances

**Treat the patient, not the dysrhythmia.** Always assess your patient for pulses, perfusion, and level of consciousness

- **Is the patient *Stable, Unstable, or Pulseless*?**
- **Next, assess the rhythm: Is it fast or slow?**
- **Is it life-threatening?**

As you treat the patient, try to discover the cause of the dysrhythmia – for many patients, their only chance of survival is if you can identify and treat a **reversible cause**. There are many possible causes of rhythm disturbances or PEA. Common causes include sympathetic stimulation, stress, hypoxia, ischemia, drugs/toxins, and electrolyte disturbances. Although lab draws can be useful, a history of the patient and the current event obtained from a family member or caregiver is often more useful

## Defibrillation (Unsyncronized Shock)

Fibrillation is a disorganized rhythm that, if present in the ventricles, is life-threatening. Immediate CPR combined with early defibrillation is critical to survival from sudden cardiac arrest. Defibrillation terminates all electrical activity in the pulseless heart in the hopes that it will resume beating in a coordinated fashion. A shock should be delivered about once every 2 minutes if the patient remains in Ventricular Fibrillation. With a monophasic monitor, the recommendation is to deliver a single shock at 360 Joules. If a biphasic monitor is used, the recommended dosage is machine-dependent, and should appear on the front of the monitor. If optimal shock dosage is not known, the consensus is to defibrillate at 200 J.

## Synchronized Cardioversion

Synchronized cardioversion is the preferred treatment for unstable patients with a tachycardia such as Atrial Fibrillation, V-Tach with a pulse, or Supraventricular Tachycardia (SVT). The shock is timed by the monitor to be delivered in coordination with the QRS complex of the heart. If the patient is conscious, consider sedation prior to cardioversion; however, **synchronized cardioversion should not be delayed while waiting for sedation** in severely symptomatic patients.

- With a **Monophasic monitor**, the initial shock is delivered at 100 J; if the rhythm does not terminate, deliver additional shocks in stepwise fashion (200J, 300J, and 360J for subsequent shocks).
- With a **Biphasic monitor**, dosage and steps are device-dependent; if optimal doses are unknown, begin at 100 J and step up from there.

## Transcutaneous Pacing (TCP)

External cardiac pacing is the recommended treatment for symptomatic bradycardias. If the patient is conscious, consider sedation; however, **pacing should not be delayed while waiting for sedation**. Begin pacing at zero milliamps, slowly increasing until capture is achieved. Then, set the rate at 20 beats per minute above the monitored heart rate, with a minimum rate of 50 bpm.

## Terminating Resuscitative Efforts

**In Hospital termination**, the decision to terminate efforts will always rest with the treating physician in the hospital. In hospital setting if the rescuers cannot rapidly ID the reversible cause (H,T's) and the patients fails to respond to BLS and ACLS interventions termination efforts should be considered.

**Out of Hospital termination**, has a different criteria needed to be met by the rescuer. **The returned of ROSC**, reliable evidence of irreversible death (**rigor mortis, brain matter or blood pooling present on the victim**), a valid DNAR document at the scene, and if the rescuer cannot continue due to physical restrictions **or an unsafe environment**. **EMS can also consider terminating resuscitative efforts after consulting with control.**

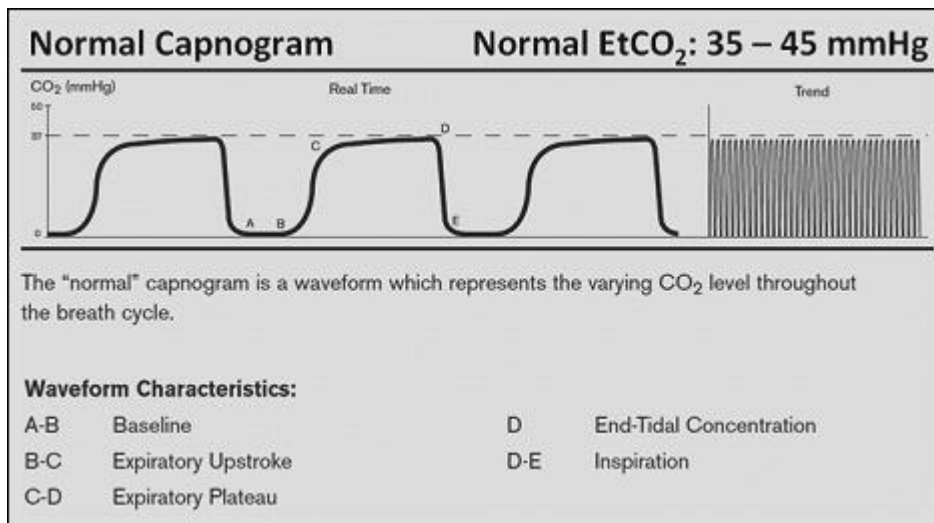
## Therapeutic Hypothermia

**Hypothermia** is the only intervention proven to aid in the neurologic recovery in a patient with ROSC. **The patient placed in hypothermia should be kept in this condition any were from 12Hr to 24Hr and the temperature can range from 32° C to 34°C. A contraindication for this treatment is if the patient is able to follow verbal commands.** The core temperature should be closely monitored by the healthcare provider. Hypothermia can be used in conjunction with PCI without any adverse effects.

## Waveform Capnography

The new 2010 American Heart Association Guidelines **now endorse wave form capnography as a recommendation for ET tube verification, monitoring CPR quality and a recommendation for detecting return of spontaneous circulation.**

It is reasonable to consider using quantitative waveform capnography in intubated patients to monitor CPR quality and optimized chest compressions **(PETCO<sub>2</sub> <10 mm Hg in intubated patients indicates that cardiac output is inadequate to achieve ROSC).** If PETCO<sub>2</sub> abruptly increases to a normal value (35 to 40 mm Hg), it is reasonable to consider that this is an indicator of ROSC.



A capnograph provides a picture of the patients cardio-respiratory system in the form of the CO<sub>2</sub> waveform which provides clinicians invaluable information. Viewing a numerical End Tidal CO<sub>2</sub> value

without the waveform is analogous to viewing the heart rate without the ECG trace.

## Normal Sinus Rhythm (NSR)



Rhythm	Regular
Rate	60 - 100
P waves	Normal in configuration & direction; one P wave precedes each QRS
PRI	Normal (0.12 - 0.20 seconds)
QRS	Normal (0.12 seconds or less)

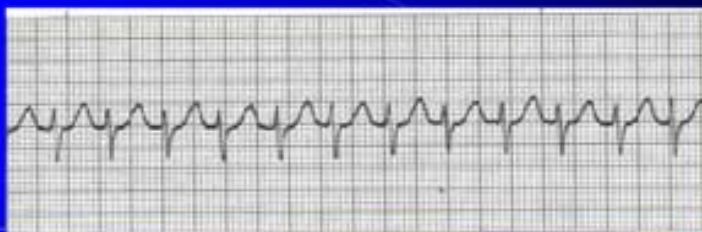
## Sinus Tachycardia

(\*Jim never has a second cup at home...\*)



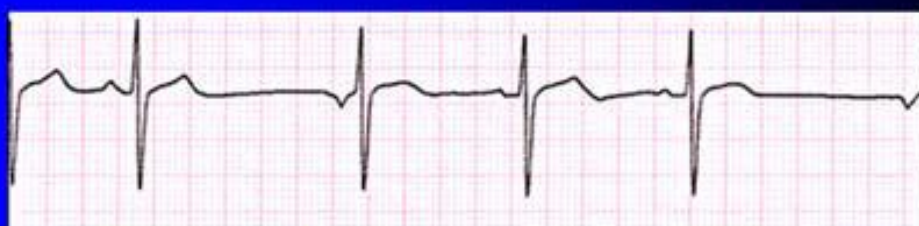
Rhythm	Regular
Rate	100 - 160
P waves	Normal in configuration & direction; one P wave precedes each QRS
PRI	Normal (0.12 - 0.20 seconds)
QRS	Normal (0.12 seconds or less)

## Supraventricular Tachycardia (SVT)



Rhythm	Regular; runs of SVT may be <b>regular or irregular</b> .
Rate	SVT rate 150-250.
P waves	P waves in the runs of SVT usually abnormal (often pointed); usually hidden in preceding T wave.
PRI	Not measurable in the runs of SVT.
QRS	Normal (0.12 seconds or less).

## Wandering Atrial Pacemaker (WAP, MAT)



Rhythm	Regular or irregular
Rate	Usually normal (60-100) or slow (less than 60); called <i>Multifocal Atrial Tachycardia</i> if fast (>100).
P waves	Vary in shape, orientation, size, and duration across rhythm strip
PRI	May vary depending on origin site; usually normal
QRS	Normal (0.12 seconds or less)

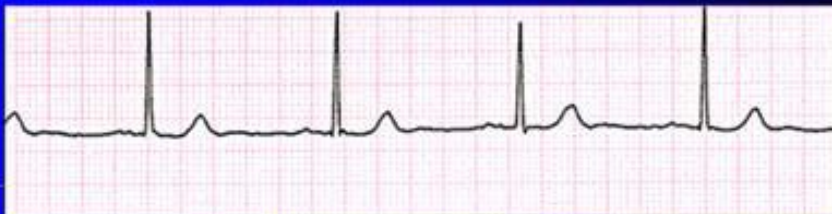


## Atrial Flutter



Rhythm	Regular or irregular (depends on AV conduction ratio)
Rate	<i>Atrial Rate: 250-400</i> <i>Ventricular Rate: Varies, but slower than the atrial rate.</i>
P waves	V-shaped flutter waves (F waves) with a "sawtooth" appearance
PRI	Not measurable
QRS	Normal (0.12 seconds or less)

## Sinus Bradycardia



Rhythm	Regular
Rate	40 - 60
P waves	Normal in configuration & direction; one P wave precedes each QRS
PRI	Normal (0.12 - 0.20 seconds)
QRS	Normal (0.12 seconds or less)

## Junctional Escape Rhythm



Rhythm	Regular
Rate	40-60
P waves	Usually inverted in Lead II; may occur before or after the QRS complex or be hidden within the QRS complex
PRI	Usually short (0.10 seconds or less); not measurable if P wave within or after QRS
QRS	Normal (0.12 seconds or less)

## First-Degree AV Block



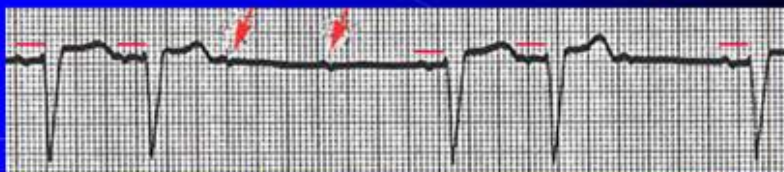
Rhythm	Regular
Rate	Heart rate is that of the underlying rhythm (usually sinus); both atrial and ventricular rates will be the same
P waves	Normal in configuration & direction; one P wave precedes each QRS
PRI	Prolonged (> 0.20 seconds); remains constant
QRS	Normal (0.12 seconds or less)

## Second-Degree AV Block Type I



Rhythm	Irregular (may be Regularly Irregular)
Rate	Depends on the underlying rhythm; Ventricular rate is less than atrial rate
P waves	Normal in configuration & direction; one P wave precedes each QRS until a P wave occurs with no following QRS complex
PRI	Progressively lengthens until a QRS is dropped, then the cycle begins again
QRS	Normal (0.12 seconds or less)

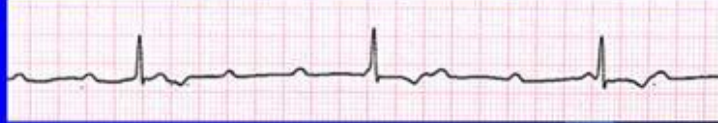
## Second-Degree AV Block Type II



Rhythm	Irregular (may be Regularly Irregular depending on the location and severity of the block)
Rate	<i>Atrial:</i> Rate of underlying rhythm <i>Ventricular:</i> Rate depends on conduction through AV node; less than the atrial rate.
P waves	Normal in configuration & direction; some P waves not followed by QRS complexes
PRI	May be normal or prolonged; remains constant
QRS	Can be Normal or Wide (depending on location of block)



## Third-Degree AV Block



Rhythm	Irregular (atrial and ventricular rhythms are each regular, but are disassociated)
Rate	<i>Atrial:</i> varies (often 60-100) <i>Ventricular:</i> varies (often 20-40)
P waves	Usually normal in configuration & direction; <b>P waves and QRS complexes have no relationship</b>
PRI	N/A (because <b>QRS complexes and P waves are completely disassociated</b> )
QRS	Can be normal but are often wide (>0.12 seconds)

## Premature Ventricular Contraction (PVC)



Rhythm	Underlying is usually regular. The PVCs may all be unifocal (same shape) or multifocal (different shapes)
Rate	Underlying rhythm may be slow (< 60), normal (60-100), or fast (> 100). More than 6 PVCs in one minute are significant.
P Waves	As normal for the underlying rhythm. The PVCs will not have P wave.
PRI	As normal for the underlying rhythm; N/A in the PVCs.
QRS	Usually normal (< 0.12) in the underlying rhythm. Usually wide (>0.12) in the PVCs, which are usually bizarre in appearance (compared to the underlying complexes).

## Idioventricular Rhythm (Ventricular Escape Rhythm)



Rhythm	Usually regular
Rate	20-40
P waves	Absent
PRI	N/A
QRS	Wide (0.12 seconds or greater) and/or bizarre in morphology

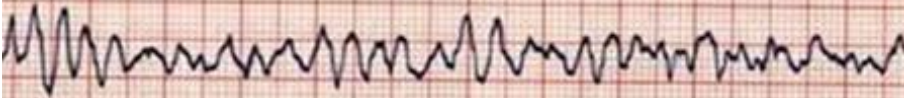
## Asystole

(Hint: This is not a good sign)



Rhythm	Regular (or "None")
Rate	0 (or "None")
P Waves	Usually absent, but may be present.
PRI	N/A
QRS	Absent

## Ventricular Fibrillation



Rhythm	Irregular; the baseline is totally chaotic.
Rate	Cannot be determined (since there are no discernible waves or complexes).
P Waves	There are no discernible P Waves.
PRI	N/A
QRS	There are no discernible QRS complexes.

## Ventricular Tachycardia



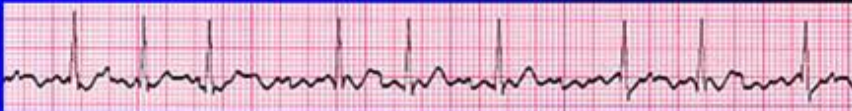
Rhythm	Usually regular
Rate	> 100 (usually 140 to 250)
P waves	SA node often still beats; however, the P wave is usually hidden in the QRS
PRI	Not measurable
QRS	Wide (0.12 seconds or greater) and/or bizarre in morphology

## Torsades de Pointes



Rhythm	Regularly irregular
Rate	> 100 (usually 140 to 250)
P waves	SA node often still beats; however, the P wave is usually hidden in the QRS
PRI	Not measurable
QRS	Wide (0.12 seconds or greater) and/or bizarre, with two distinct morphologies

## Atrial Fibrillation (A-Fib, AF)



Rhythm	Irregular (often grossly irregular)
Rate	<i>Atrial Rate:</i> 350 or more <i>Ventricular Rate:</i> Varies, but slower than the atrial rate.
P waves	Irregular <i>fibrillatory waves</i> ; sinus P waves usually not present.
PRI	Not measurable
QRS	Normal (0.12 seconds or less)



# ACLS Medications Review

This information on medications meets the standard set by the 2010 American Heart Association for Advanced Cardiac Life Support. It does not supersede local protocols or medical control; consult with your medical director for the most up-to-date guidelines on medication administration where you work. IV/IO medications should be administered in a peripheral line during CPR, as soon as possible after a rhythm check. It is recommended that you flush with 20 ml of fluid after each drug administration and elevate the extremity. Always use large bore catheters if possible.

*A Note on Endotracheal Administration of Medications:* This route of medication administration is being de-emphasized by the AHA – **the IV or IO routes are preferred.** However, the ET route can still be used if providers are unable to gain access by IV/IO. Use the mnemonic “NAVEL” to remember which drugs can be administered via this route:

**Narcan – Atropine – Vasopressin – Epinephrine – Lidocaine.**

If using the ET route, the drug dosage must be increased, typically 2-2.5 times the IV/IO bolus dosage (although there is no consensus on Epinephrine or Vasopressin dosing via this route), followed by a 10 ml normal saline flush.

## **ADENOSINE**

**Class: Indicated for: IV Bolus Dosage (no IO):**

Endogenous nucleoside PSVT / Regular Narrow- 6 mg rapid IV push – 1<sup>st</sup> dose; complex Tachycardia 12 mg rapid IV push – 2<sup>nd</sup> dose 12 mg rapid IV push – 3<sup>rd</sup> dose

*Notes:* Doses are followed by a saline flush. Two subsequent doses of 12 mg each may be administered at 1 – 2 minute intervals. Use the port closest to cannulation. The AHA recommends that the dose be cut by half if administering through a central line, or in the presence of Dipyridamole or Carbamazepine. Larger doses may be required in the presence of caffeine or Theophylline.

## **AMIODARONE**

**Class: Indicated for: IV-IO Bolus Dosage:**

Antiarrhythmic V-Fib / Pulseless V-Tach 300 mg – 1<sup>st</sup> dose; 150 mg – 2<sup>nd</sup> dose Arrhythmias 360 mg over 6 hours (slow) 150 mg over 10 minutes (rapid) Infusion dose 540 mg IV/IO over 18 hours (.5 mg/min) *Notes:* Cumulative doses >2.2 g/24 hours are associated with significant hypotension. Do not administer with other drugs that prolong QT interval (i.e., Procainimide). Terminal elimination is extremely long – half life lasts up to 40 days. During arrest, IV bolus should be delivered slowly, over 1 – 3 minutes.

## **ASPIRIN**

### **Class: Indicated for: *PO Dosage (no IV-IO):***

NSAID (Non-Steroidal Chest pain / ACS 160 mg – 325 mg Anti-Inflammatory Drug) *Suppository Dose:* 300 mg

*Notes:* In suspected ACS, Aspirin can block platelet aggregation and arterial constriction. Also helps with pain control. May cause or exacerbate GI bleeding.

## **ATROPINE**

### **Class: Indicated for: *IV-IO Bolus Dosage:***

Parasympathetic Blocker Bradycardia 0.5 mg every 3-5 minutes as needed

*Notes:* Used only in symptomatic bradycardia with heart rate < 60. (Not indicated in Second Degree Type II or Third Degree heart block.) Doses < 0.5 mg may result in paradoxical slowing of the heart. ET route discouraged, but can be used if IV/IO access not available.

## **DEXTROSE/GLUCOSE**

### **Class: Indicated for: *IV-IO Bolus Dosage:***

Carbohydrate Hypoglycemia 25 g (50 ml) of D<sub>50</sub>W

*Notes:* Used to reverse documented hypoglycemia in patients with symptomatic bradycardia or during cardiac arrest. Should not be used routinely during cardiac arrest.

## **DILTIAZEM**

### **Class: Indicated for: *IV Dosage:***

Calcium Channel Blocker A-Fib / A-Flutter 15-20 mg over 2 minutes

*Notes:* May cause hypotension. Do not use in wide-QRS tachycardias of uncertain origin.

## **DOPAMINE**

### **Class: Indicated for: *IV Infusion:***

Catecholamine Symptomatic Bradycardia 2-10 µg/kg/min – cardiac dose

Hypotension 10-20 µg/kg/min – vasopressor dose

*Notes:* Titrate to patient response. Correct hypovolemia with volume replacement before initiating Dopamine. May cause tachyarrhythmias. Do not mix with Sodium Bicarbonate.

## **EPINEPHRINE**

### **Class: Indicated for: IV-IO Bolus Dosage:**

Catecholamine Pulseless Arrest 1 mg (1:10,000) every 3-5 minutes

Symptomatic Bradycardia *Infusion*: 1 mg in 500ml of D<sub>5</sub>W or NaCl

at 1 µg/min titrated to effect.

*Notes*: First line drug in all pulseless rhythms. Increases myocardial oxygen demand, and may cause myocardial ischemia or angina. ET route is discouraged, but if used give 2-2.5 mg of a 1:1000 solution diluted in 10 ml normal saline.

## **FLUID ADMINISTRATION (e.g., Normal Saline / NaCl)**

### **Class: Indicated for: IV/IO Bolus Dosage:**

Fluid Volume Hypovolemia 250 – 500 cc bolus (repeat as needed)

*Notes*: Use to treat specific reversible causes, such as hypovolemia.

Routine administration of fluids during a resuscitation is not indicated, as it can reduce coronary perfusion pressure.

## **HEPARIN (Unfractionated)**

### **Class: Indicated for: IV/IO Bolus Dosage:**

Anticoagulant STEMI (AMI) *Initial Dose*: 60 IU/kg (max. 4000 IU)

*Infusion*: 12 IU/kg/hr (max. 1000 IU/hr)

*Notes*: Do not use in patients with active bleeding or bleeding disorders; severe hypertension; or recent surgery. Monitor aPTT and platelet count while administering.

## **LIDOCAINE**

### **Class: Indicated for: IV / IO Bolus Dosage:**

Antiarrhythmic V-Fib/Pulseless V-Tach 1-1.5 mg/kg (1<sup>st</sup> dose)

Stable V-Tach *Infusion*: 1-4 mg/min (30-50 µg/kg/min)

*Notes*: May repeat at 0.5-0.75 mg/kg every 5-10 minutes to a max. dose of 3 mg/kg. Use with caution in presence of impaired liver; discontinue if signs of toxicity develop. Prophylactic use in AMI is contraindicated. ET route discouraged, but can be used if IV/IO access not available.

## **MAGNESIUM SULFATE**

### **Class: Indicated for: IV/IO Bolus Dosage:**

Electrolyte Torsades de pointes or 1-2 g in 10 ml D<sub>5</sub>W over 5-20 minutes

Hypomagnesemia

*Notes*: A fall in blood pressure may be noted with rapid administration. Dose is given over 5-20 minutes during cardiac arrest, 5-60 minutes in living patients. Use with caution in renal failure.

## **MORPHINE SULFATE**

### **Class: Indicated for: IV/IO Bolus Dosage:**

Opiate / Analgesic Chest pain 2-4 mg every 5-30 minutes  
Pulmonary edema

*Notes:* Administer slowly and titrate to effect; may cause hypotension. May cause respiratory depression – be prepared to support ventilations. Naloxone is the reversal agent.

## **NALOXONE HYDROCHLORIDE (NARCAN)**

### **Class: Indicated for: IV/IO Bolus Dosage:**

Opiate Antagonist Narcotic overdose 0.4-2.0 mg (up to 10 mg in 10 min.)

*Notes:* Monitor for recurrence of respiratory depression. May cause opiate withdrawal. ET route discouraged, but can be used if IV/IO access not available.

## **NITROGLYCERIN**

### **Class: Indicated for: IV Bolus Dosage:**

Vasodilator Chest pain/ACS 12.5-25 µg in D5W or NaCl

*Sublingual Dose:* 0.3 – 0.4 mg

*Notes:* Most commonly given sublingually as tablet or spray – repeat up to 3 doses at 5 minute intervals. Hypotension may occur. Do not use with **Viagra** (Question Females as well as Males) or other **phosphodiesteraseinhibitors**; with severe bradycardia or tachycardia; or in presence of RV infarction or inferior MI.

**Do not mix with other drugs.**

## **OXYGEN**

### **Class: Indicated for: Flow Rate:**

Atmospheric Gas Any cardiopulmonary *Stable Patient:* 2-6 lpm via NC  
emergency *Unstable Patient:* 10-15 lpm via NRB Suspected stroke

*Notes:* Pulse oximetry provides a useful method of titrating oxygen administration; however, it may be inaccurate in low cardiac output states or in patients with specific toxicities (such as Carbon Monoxide exposure).

## **SODIUM BICARBONATE**

### **Class: Indicated for: IV Bolus Dosage:**

Buffer Acidosis, hyperkalemia 1 mEq/kg

*Notes:* Not recommended for routine use in cardiac arrest patients. If available, use arterial blood gas analysis to guide bicarbonate therapy.



## **VASOPRESSIN**

### **Class: Indicated for: IV - IO Bolus Dosage:**

Hormone Pulseless arrest 40 U IV - IO

*Notes:* Only given one time **to replace the first or second dose of Epinephrine**; Epinephrine dosing can continue 3 to 5 minutes after Vasopressin is administered. Vasopressin should not replace antiarrhythmics (such as Amiodarone). May cause cardiac ischemia and angina. Not recommended for responsive patients with coronary artery disease. ET route discouraged, but can be used if IV/IO access not available.

## **VERAPAMIL**

### **Class: Indicated for: IV Bolus Dosage:**

Calcium Channel Blocker A-Fib/A-Flutter, PSVT 2.5-5 mg over 2-5 minutes

*Notes:* Alternative drug after Adenosine to terminate PSVT with adequate blood pressure and preserved LV function. Can cause peripheral vasodilation and hypotension. Use with extreme caution in patients receiving oral  $\beta$ -blockers.