CSI 202 - Skills Lab #5: Arrhythmia Interpretation and Treatment

Origins of the ACLS Approach:

ACLS training originated in Nebraska in the early 1970's. Its purpose was to bring order and organization to the treatment of cardiac arrest.

Primary Survey: (CAB)

Focus on the basic CPR and defibrillation

Circulation: give chest compressions (30 compressions - rate of 100 - 120/min)

Airway: open the airway

Breathing: provide positive-pressure ventilation (2 breaths)

AED/Defibrillation: ARRIVES *(VF/pulseless VT)*

1. Check the patient for responsiveness and presence/absence of normal breathing or gasping.
2. Call for help.
3. Check the pulse for no more than 10 seconds.
4. Give 30 compressions. *(2 inches; > 100 - 120/min.)*
5. Open the airway and give 2 breaths. *(Over 1 second)*
6. Resume compressions.

The 2 basic ACLS skills are the ability to perform CPR and operate an AED (Automated External Defibrillator). There are 7 advanced ACLS skills:

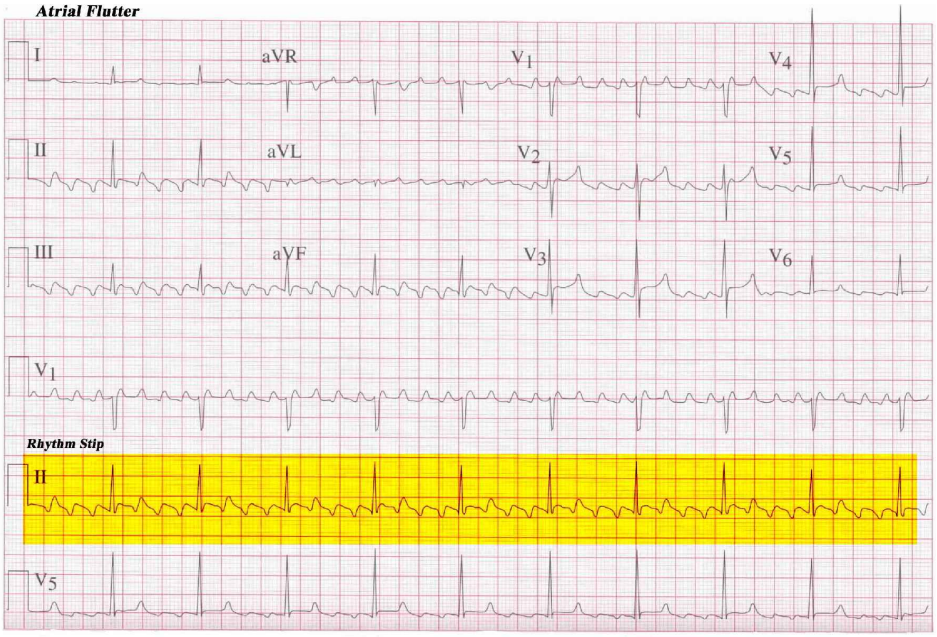
1. Care of the airway.
2. Recognition of rhythm
3. Electrical therapy I: defibrillation
4. Electrical therapy II: cardioversion
5. Electrical therapy III: transcutaneous pacing
6. IV access to circulation
7. Selection of appropriate resuscitation medication

Medications:

Drug	Dose	Route	Treatment
Adenosine	6-12 mg	IV push with saline flush, q 5 min.	SVT
Diltiazem	0.25 mg/kg – 20 mg then 0.35 mg/kg – 25 mg	IV	Stable, narrow-complex tachycardias, AF or SVT
Epinephrine	1 mg	IV q 3-5 min	Asystole, Brady, PEA & VF
Atropine	0.5 – 1 mg to 0.04mg/kg (e.g. 3 mg)	IV	Brady
Amiodarone	300 mg x 1 dose 150 mg (2^{nd} dose)	IV bolus	VF, VT
Procainamide	20 mg to 50 mg/min until arrhythmia suppressed	IV	Pre-excited AF, Tachy
Lidocaine	1 to 1.5 mg/kg bolus 0.5 to 0.75 mg/kg every 5 mins (Max 3 mg/kg)	Push Q 8-10 min Infuse 1-4 mg/min	Hemodynamically stable monomorphic VT
Vasopressin	40 IU	IV push 1 dose only	Asystole, PEA, VT/VF

1. **Atrial Flutter**

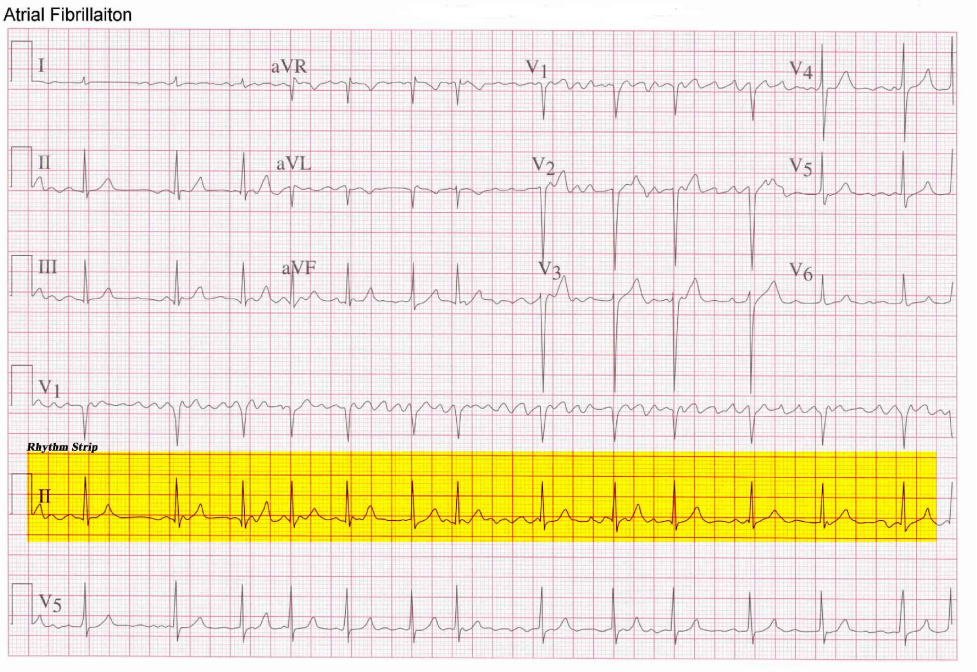
Rate: Has many atrial contractions for one ventricular contraction. Atrial rate is 250-350 beats/minute. Ventricular is usually between 60-100 beats/minute. If the ventricular rate is 150, 2:1 conductance; 2 atrial contractions to 1 ventricular contraction.
Rhythm: Both atrial and ventricular patters are regular, but they don't match in rate.
PQRST Information: Has P wave (saw-toothed or flutter waves), QRS complex, but the T wave is not seen because it is covered by the many P waves.



Differential Diagnosis: Acute Coronary Syndrome, Cardiomegaly, Coronary Artery Disease
Signs & Symptoms: SOB, palpitation & Chest Pain (CP)
Treatment: Synchronous DC shock, digitalis, quinidine, propranolol, diltiazem

2. **Atrial Fibrillation**

Rate: Atrial Pattern is like a quivering line – 400 beats/minute. Ventricular pattern is present and can be normal or faster than normal.
Rhythm: Both are atrial rhythm and the ventricular rhythms are irregular.
PQWRST Information: There is no actual P wave, but rather a fine wavy line. QRS complex is present. The T wave is not evident.



Differential Diagnosis: (**PIRATES- P**ulmonary disease, **I**schemia, **R**heumatic heart disease, **A**nemia, atrial myxoma, **T**hyrotoxiosis, **E**thanol, **S**epsis) cardiac valve disorder, hypertensive cardiovascular disease, cardiomyopathy, MI, thyrotoxicosis, COPD, constrictive pericarditis, CHF, certain drugs.

Signs & Symptoms: SOB, palpitation & Chest Pain (CP)
Treatment: Precipitating cause, use of pharmacological agents for cardioversion or electrical synchronized cardioversion is common to convert a rhythm to SR. Ablation can be done in the Electro-Physiology (EP) lab to interrupt the aberrant foci, as a cure for A fib. *Rate Control:* Digoxin, Beta blockers. *Antiarrhythmics:* Corvert, Cardizem, Procainimide, Quinidine, Amiodarone

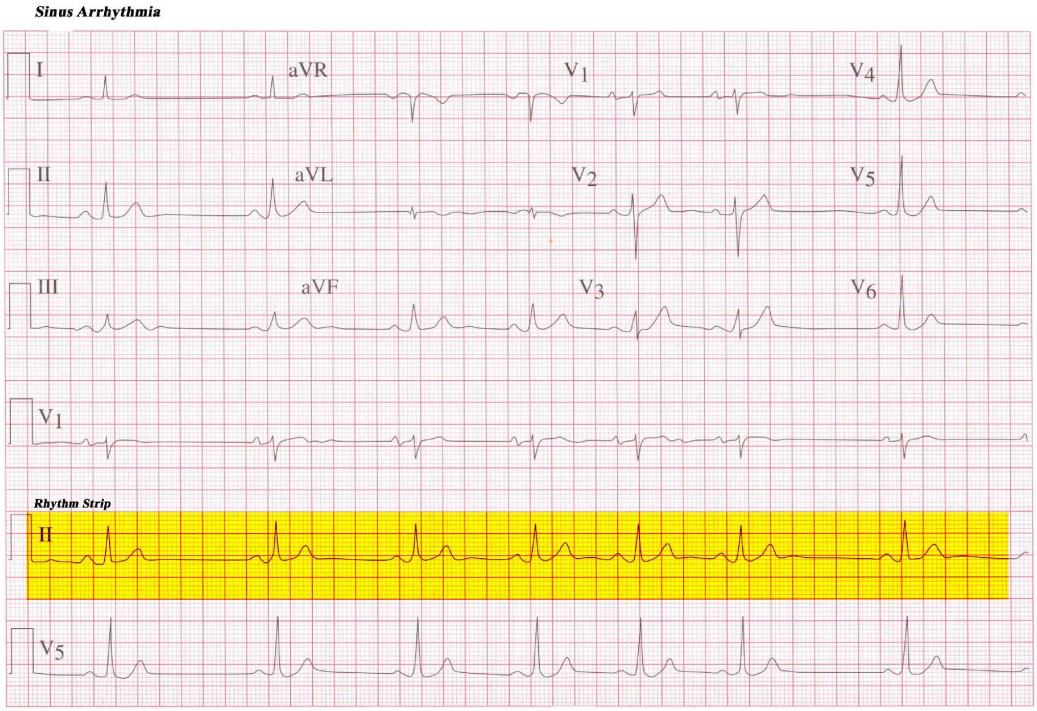
****Anti-coagulate** in new-onset, significant risk for embolization.

3. Sinus Bradycardia
Rate: Both the atria and ventricles are less than 60 beats/minute.
Rhythm: Regular rhythm throughout
PQRST Information: Has P wave, ORS complex, and T wave present.

Differential Diagnosis: Frequently seen in athletes, during sleep, with increased intracranial pressure, increase vagal tone (pain, valsalva, cord injury) , after an acute MI involving the right coronary artery (supplies blood to the SA node), hyperkalemia, treatment with beta blockers, Ca^{2+} channel blockers, sympatholytic drugs, digitalis, morphine, or demerol.

Signs & Symptoms: pulse, 60, fatigue, lightheadedness, syncope, may be assymptomatic.
Treatment: Treat underlying cause, heart rate is maintained with drug (atropine) or a pacemaker if symptomatic.

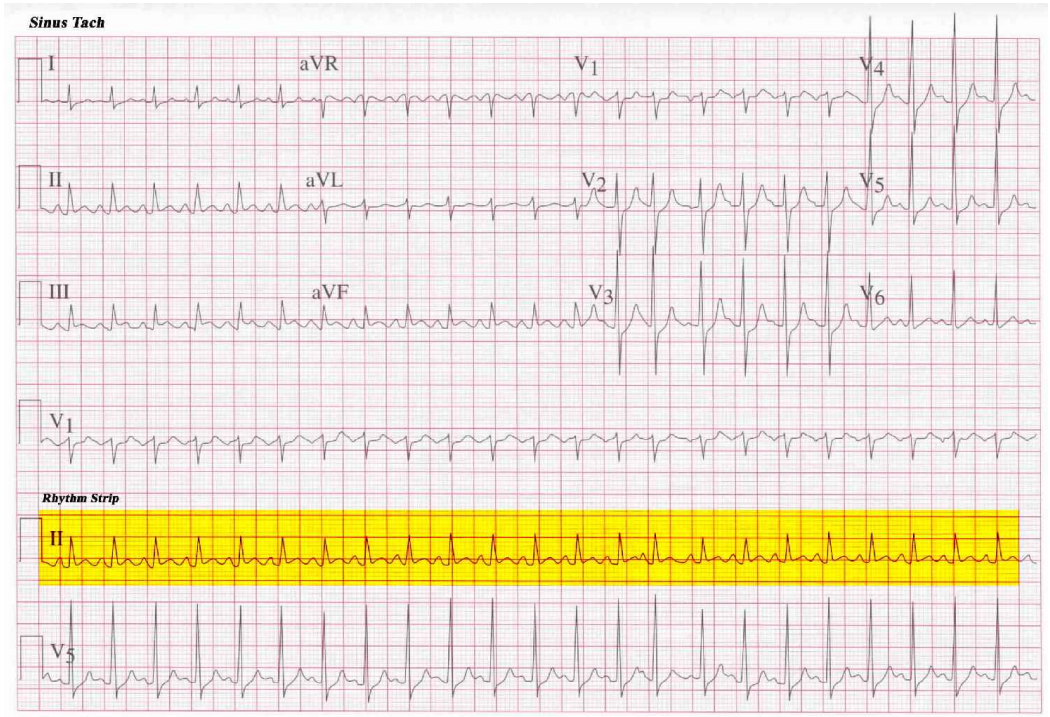
4. Sinus Arrhythmia
Rate: Atrial and ventricular contraction are present and measure between 60-100 beats/minute.
Rhythm: Slightly irregular
PQRST Information: Has P wave, QRS complex, and T wave present.



Differential Diagnosis: A variation in sinus rhythm that usually related to respiratory rate and results from increase vagal tone inhibition. The heart rate increases with inspiration and decreases with exhalation. Common in athletes. A marked variation in P-P interval may indicate Sick Sinus Syndrome & Wandering Pacemaker.

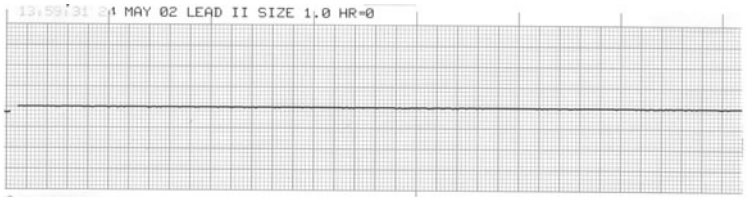
Signs & Symptoms: Uncommon, palpitations or dizziness
Treatment: Unnecessary

5. Sinus Tachycardia
Rate: Atrial and ventricular contractions are present and the rate measures 100-160 beats/minute.
Rhythm: Regular
PQRST Information: Has P wave, QRS complex, and T wave present



Differential Diagnosis: pain, anxiety, drugs (amphetamines)
Signs & Symptoms: SOB, pain, and anxiety
Treatment: None, unless symptomatic; treat underlying disease

6. **Asystole** (Ventricular Standstill)
Rate: No rate observable because the atrial pattern may be visible or not and the ventricular pattern is not present.
Rhythm: Atria rate, if present, is regular. Ventricular rate not shown/visible.
PQRST Information: P wave often present, QRS complex absent, and no T wave visiable.

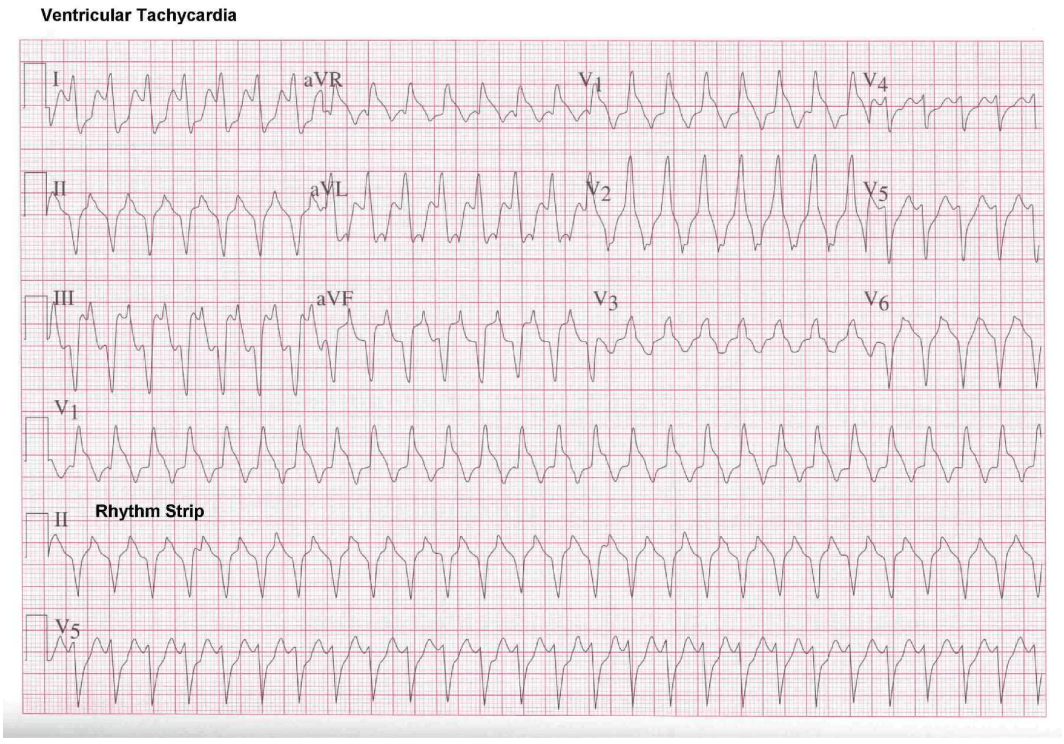


Most Frequent Causes of Asystole and PEA (5-H's & 5 -T's)

Hypovolemia	**T**oxins (OD)
Hypoxia	**T**amponade, cardiac
Hydrogen ion- (acidosis)	**T**ension pneumothorax
Hyer-/hypokalemia	**T**hrombosis, coronary or pulmonary
Hypothermia	**T**rauma

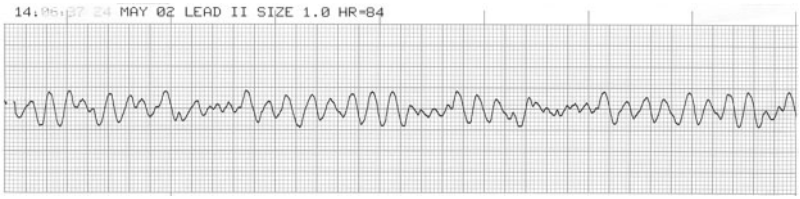
Differential Diagnosis: See above table. Commonly in severely diseased hearts. Leads disconnected.
Signs & Symptoms: Death
Treatment: Transcutaneous pacing, Epinephrine and Atropine, reversible conditions associated with asystole

7. **Ventricular Tachycardia** (V-tach, VT)
Rate: There is no atrial contraction visible – the ventricular contraction is present and rapid (100-250 beats/minute)
Rhythm: Atrial rhythm is not apparent; ventricular rhythm is usually regular.
PQRST Information: P wave is not visible. QRS complex is wide and bizarre. The T wave is present and always pointing in the opposite direction of the QRS complex.



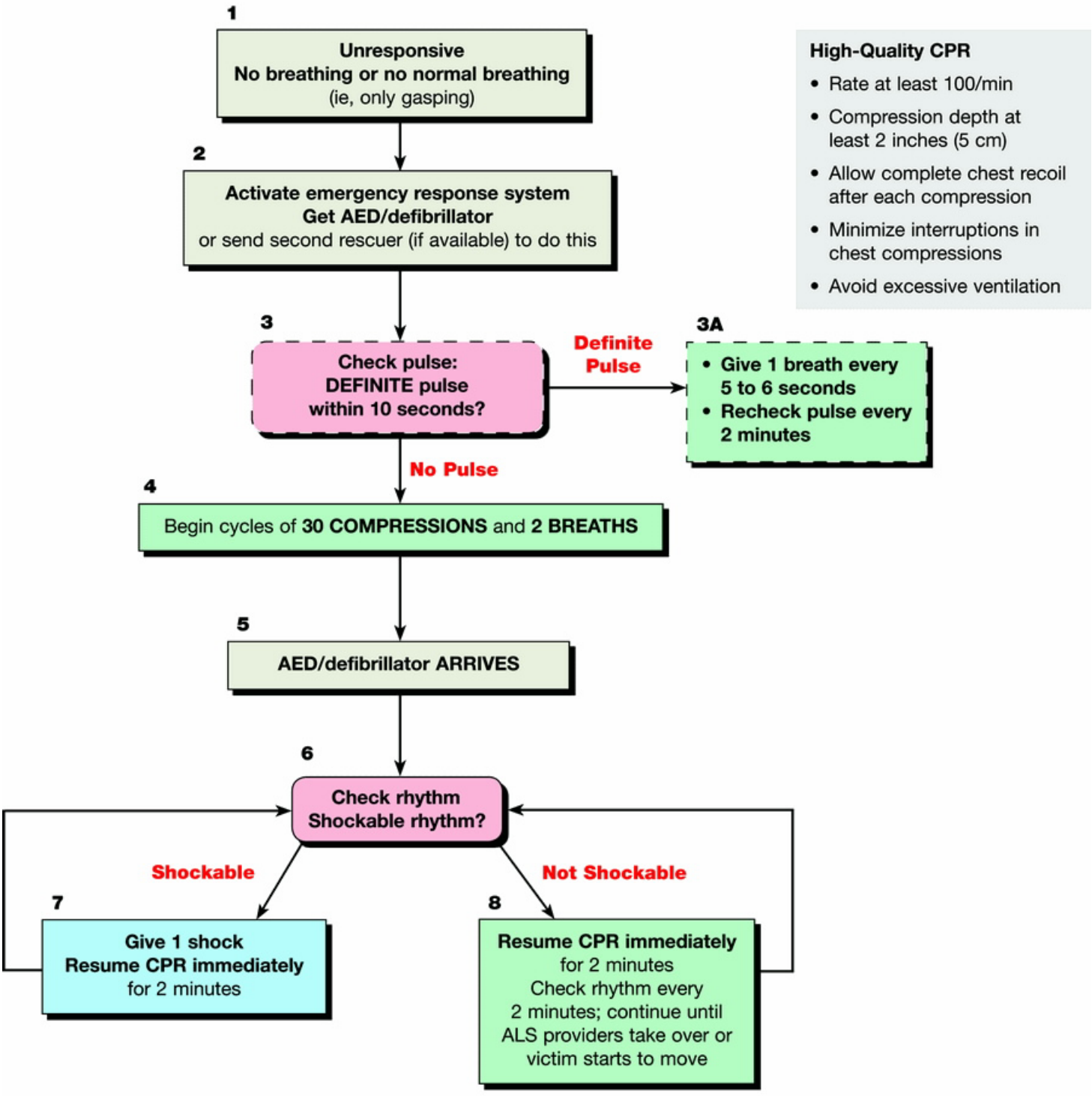
Differential Diagnosis:
Signs & Symptoms: change in mental status, CP, SOB, palpitation, pulse vs. pulseless
Treatment: Lidocaine, procainamide, DC shock, quinidine

8. Ventricular Fibrillation
Rate: not apparent.
Rhythm: rapid and chaotic – looks like an uneven line.
PQSRT Information: No P wave, No QRS complex, and no T wave.

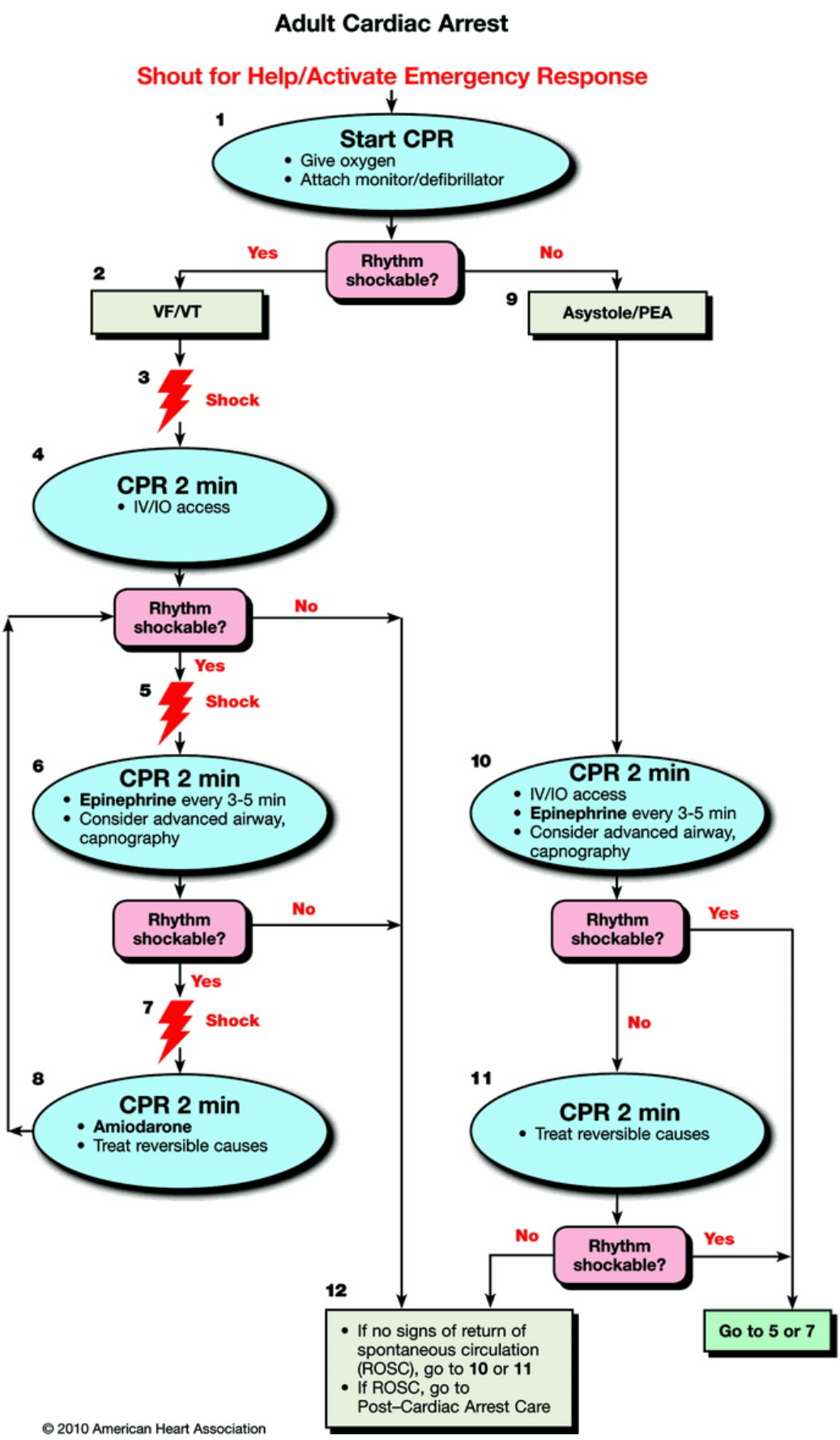


Differential Diagnosis: Lead artifact.
Signs & Symptoms: Level of Conscious (LOC), Death
Treatment: DC shock

Adult BLS Healthcare Providers



Note: The boxes bordered with dashed lines are performed by healthcare providers and not by lay rescuers



CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

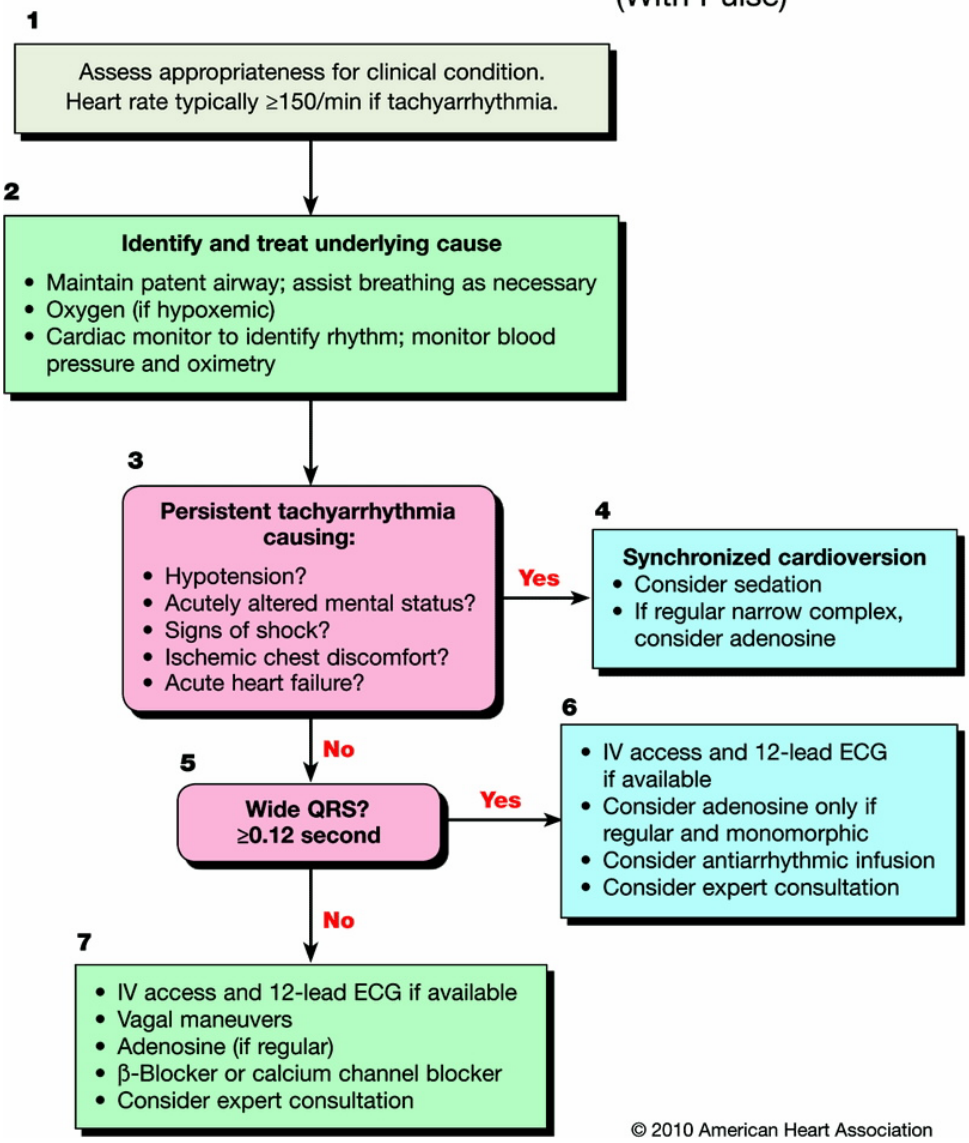
Shock Energy
- **Biphasic:** Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy
- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

Reversible Causes
- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

Adult Tachycardia
(With Pulse)



Doses/Details

Synchronized Cardioversion
Initial recommended doses:
- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (NOT synchronized)

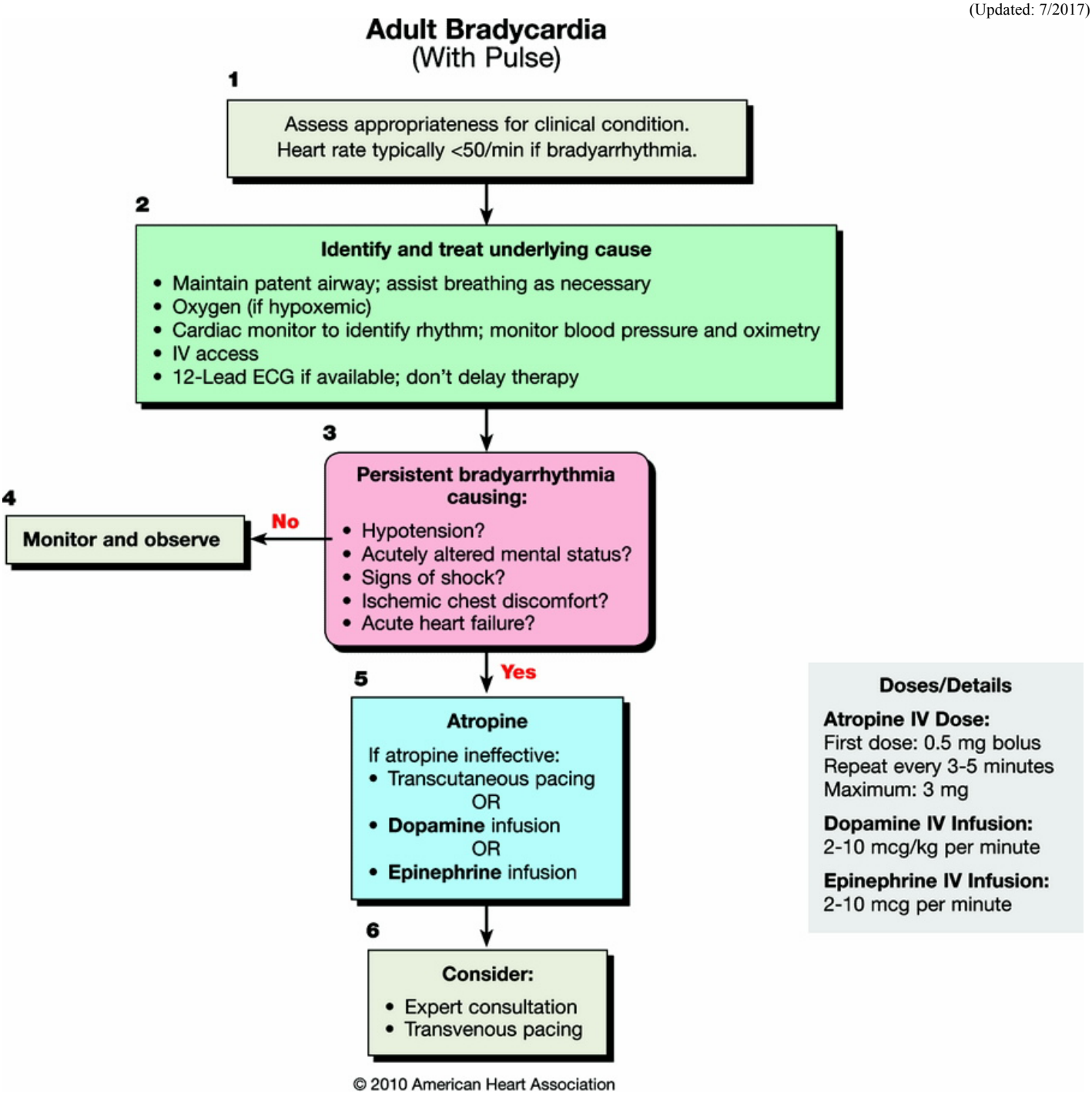
Adenosine IV Dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV Dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given. Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

Amiodarone IV Dose:
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

Sotalol IV Dose:
100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.


Adult Bradycardia
(With Pulse)
1
Assess appropriateness for clinical condition.
Heart rate typically <50/min if bradyarrhythmia.
2
Identify and treat underlying cause
• Maintain patent airway; assist breathing as necessary
• Oxygen (if hypoxemic)
• Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
• IV access
• 12-Lead ECG if available; don't delay therapy
3
Persistent bradyarrhythmia causing:
• Hypotension?
• Acutely altered mental status?
• Signs of shock?
• Ischemic chest discomfort?
• Acute heart failure?
No
4
Monitor and observe
Yes
5
Atropine
If atropine ineffective:
• Transcutaneous pacing
OR
• Dopamine infusion
OR
• Epinephrine infusion
6
Consider:
• Expert consultation
• Transvenous pacing
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Doses/Details
Atropine IV Dose:
First dose: 0.5 mg bolus
Repeat every 3-5 minutes
Maximum: 3 mg
Dopamine IV Infusion:
2-10 mcg/kg per minute
Epinephrine IV Infusion:
2-10 mcg per minute