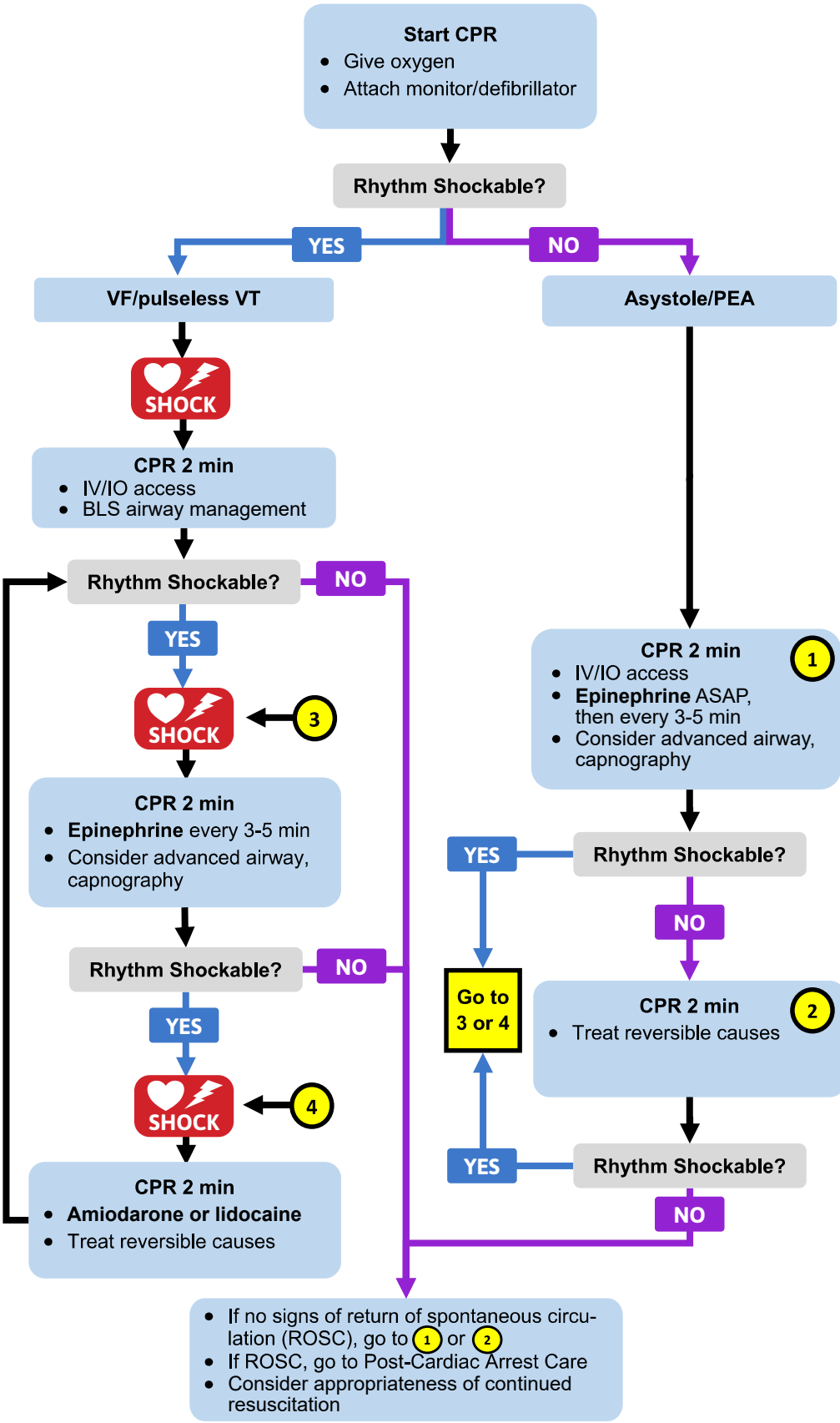
ProTrainings
Because Life Matters

ProACLS Adult Algorithm
Cardiac Arrest
VF, Pulseless VT, Asystole, PEA



Dose/Details

CPR Quality

- Push hard (at least 2 inches (5cm)) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If $PETCO_2$ <10 mmHg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 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
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose 150 mg.
  or
  Lidocaine IV/IO dose: First dose: 1-1.5mg/kg. Second dose: 0.5-0.75mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥40 mmHg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes (H's & T's)

- **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

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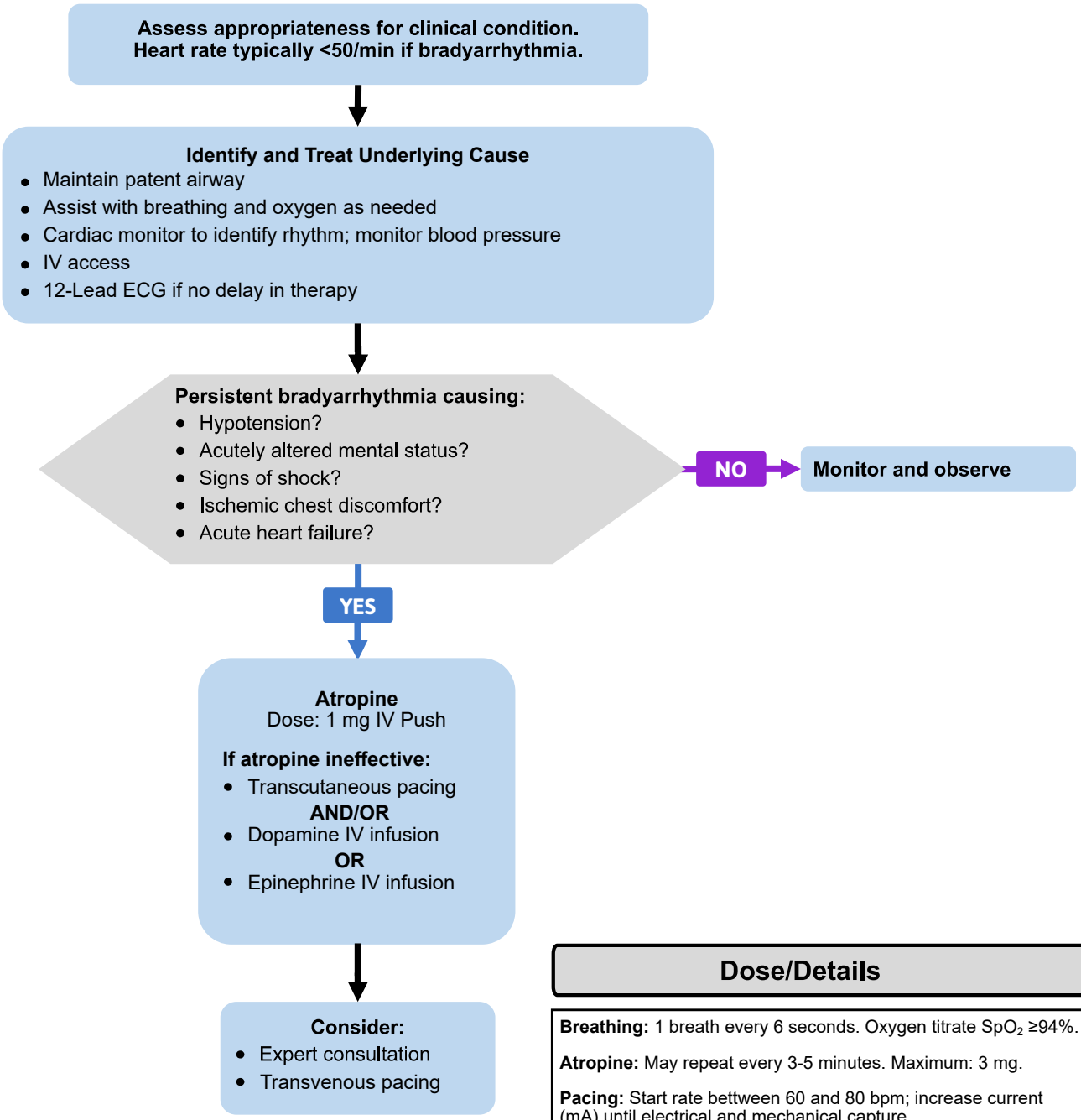
Bradycardia with a Pulse



Dose/Details

Breathing: 1 breath every 6 seconds. Oxygen titrate SpO_2 ≥94%.

Atropine: May repeat every 3-5 minutes. Maximum: 3 mg.

Pacing: Start rate between 60 and 80 bpm; increase current (mA) until electrical and mechanical capture.

Dopamine: 5-20 mcg/kg per minute. Titrate to patient response.

Epinephrine: 2-10 mcg per minute infusion. Titrate to patient response.

Identify possible causes:
-Myocardial ischemia/infarction
-Drugs/toxicological (eg, calcium channel blockers, beta-blockers digoxin
-Hypoxia
-Electrolyte abnormality (eg, hyperkalemia)

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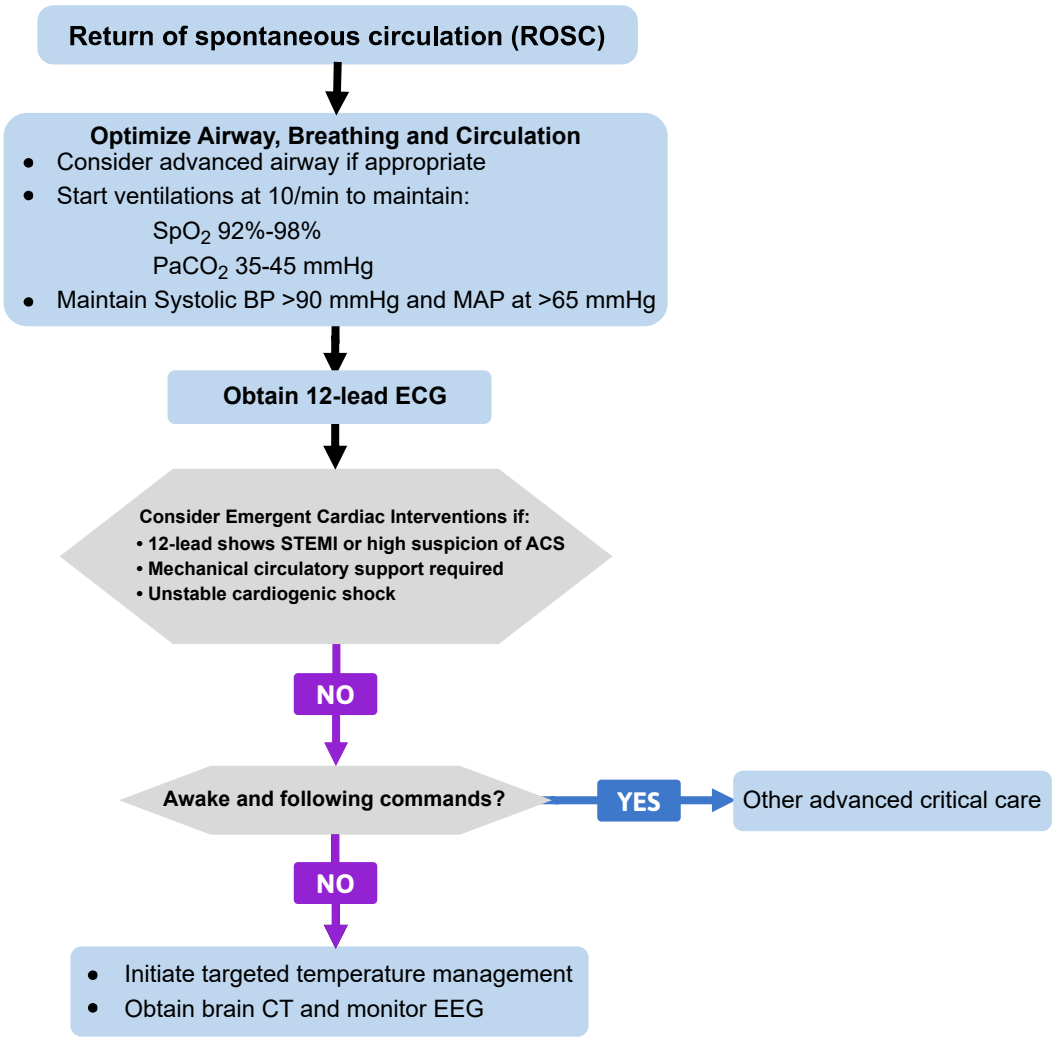
Immediate Post-Cardiac Arrest Care



Dose/Details

Circulation

IV Bolus:
Approximately 1-2 L normal saline, Lactated Ringers, or other crystalloid solutions.

Epinephrine IV infusion:
2-10 mcg per minute

Dopamine IV infusion:
5-20 mcg/kg per minute

Norepinephrine IV infusion:
0.1-0.5 mcg/kg per minute - titrate to response
(in 70-kg adult: 7-35 mcg per minute)

Reversible Causes (H's & T's)

- **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

Targeted Temperature Management
Start as soon as possible. 32-36 degrees C for 24 hours.

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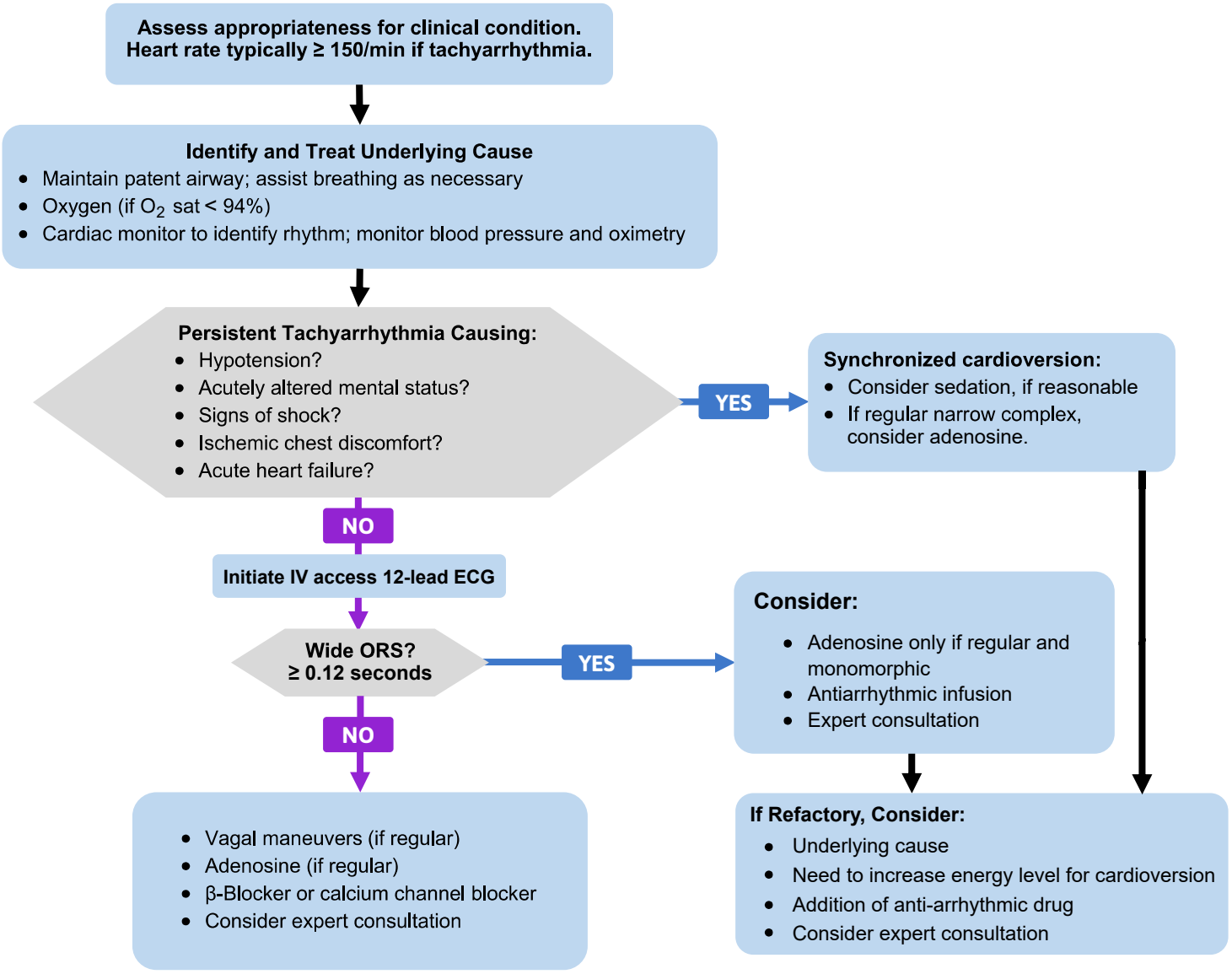
Tachycardia with a Pulse



Dose/Details

Synchronized cardioversion: Recommended doses are based on manufacture recommendations.

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.

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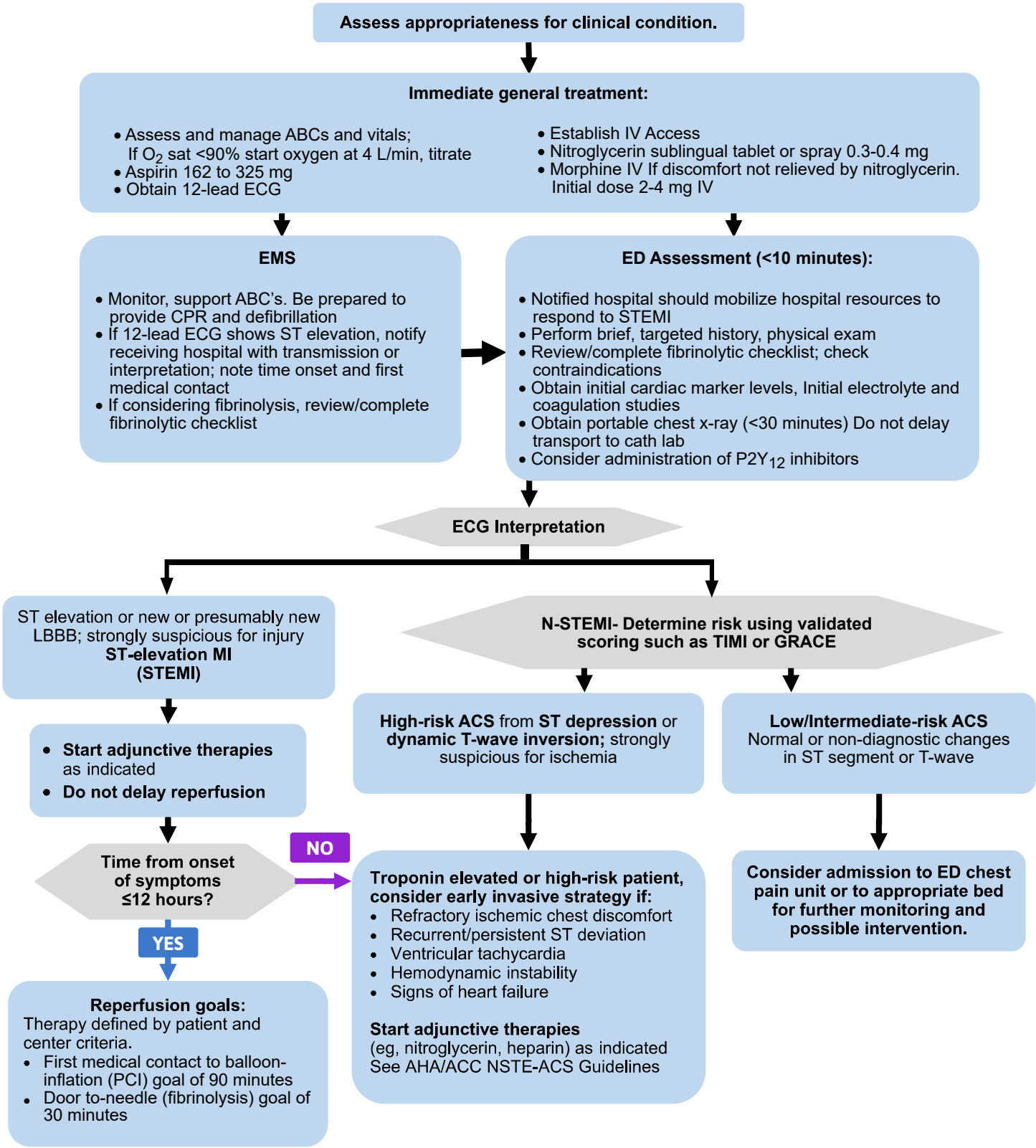
ProACLS Adult Algorithm

Acute Coronary Syndrome



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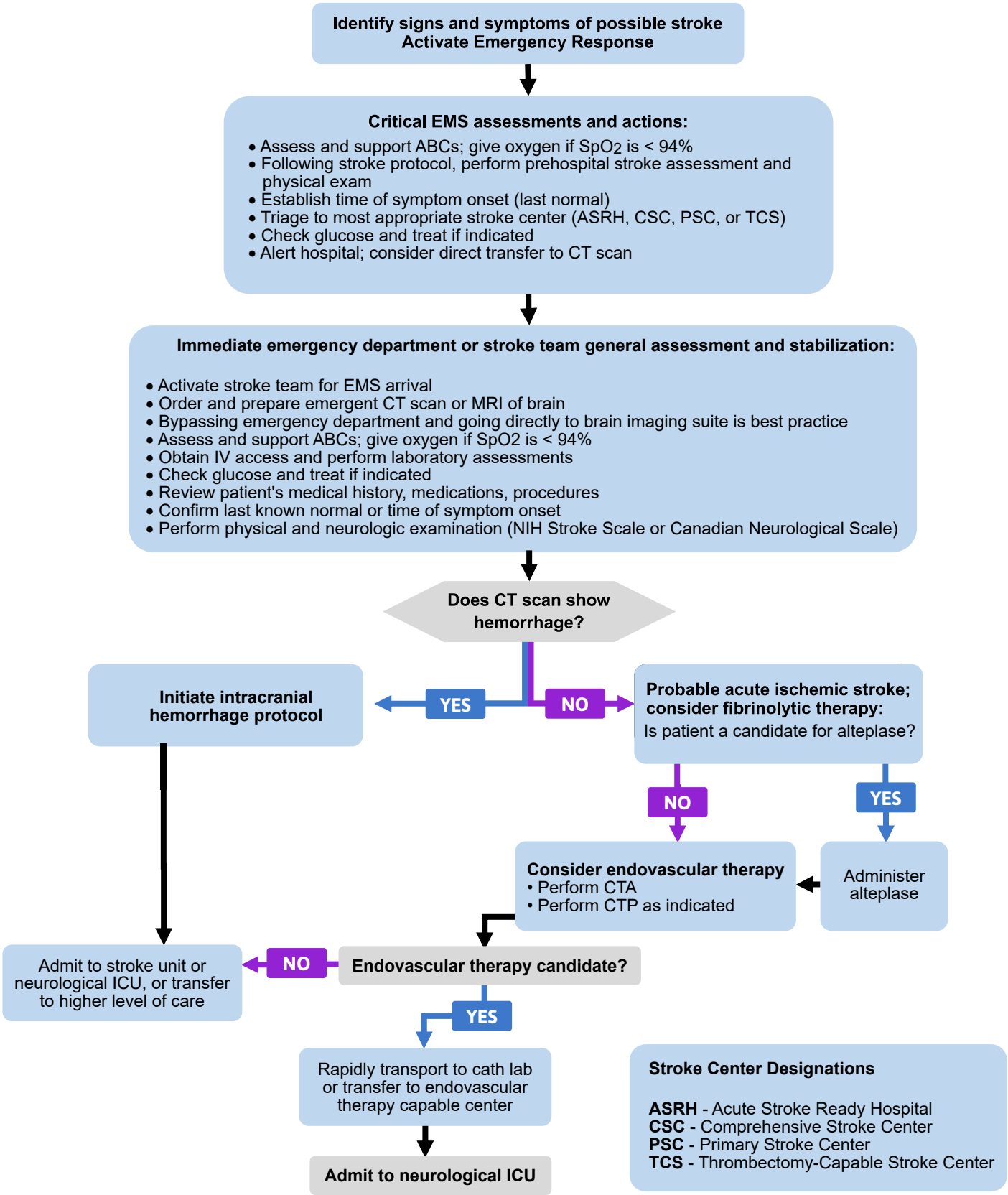
ProACLS Adult Algorithm
Suspected Stroke



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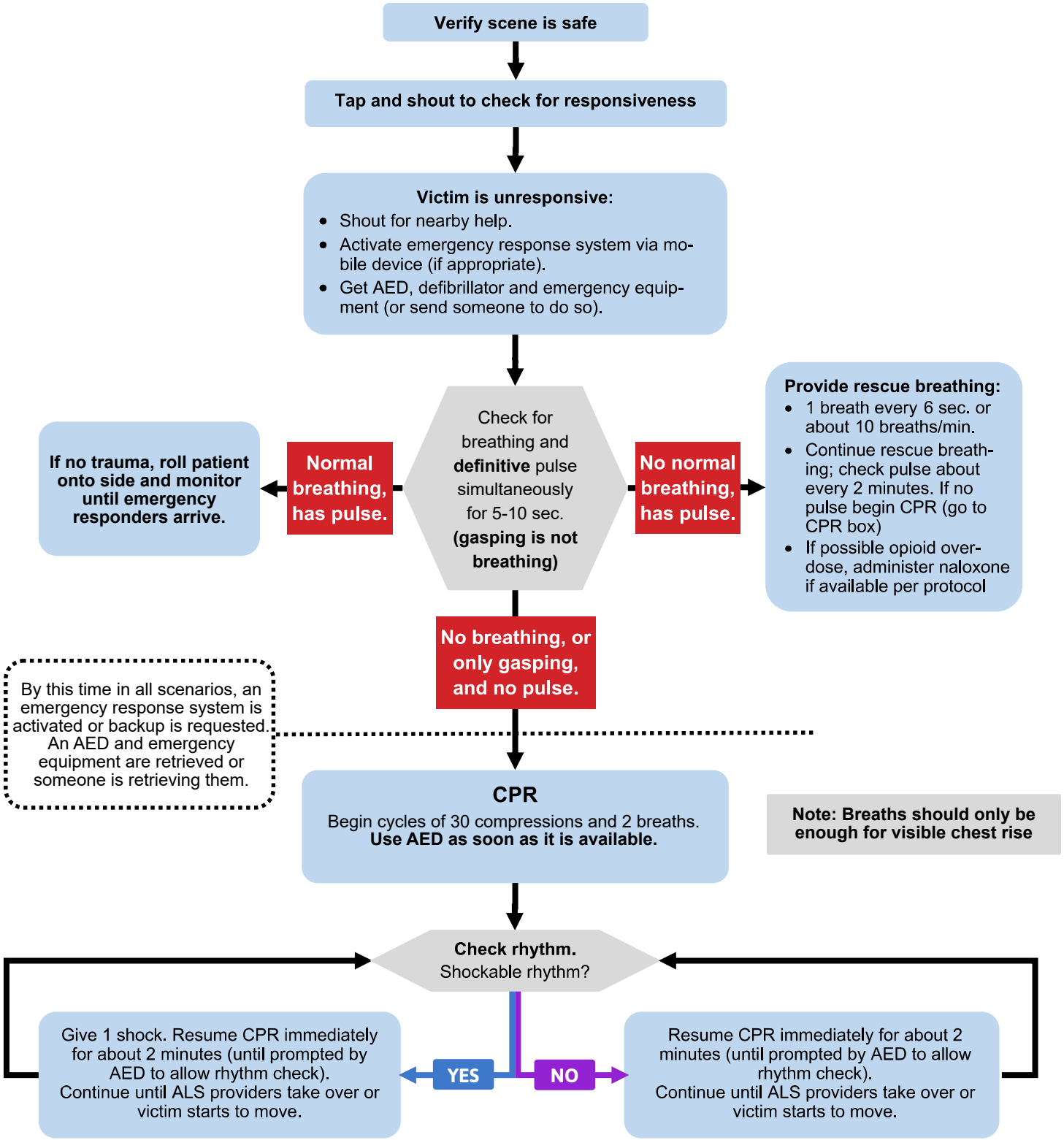
ProACLS Adult Algorithm
BLS Cardiac Arrest



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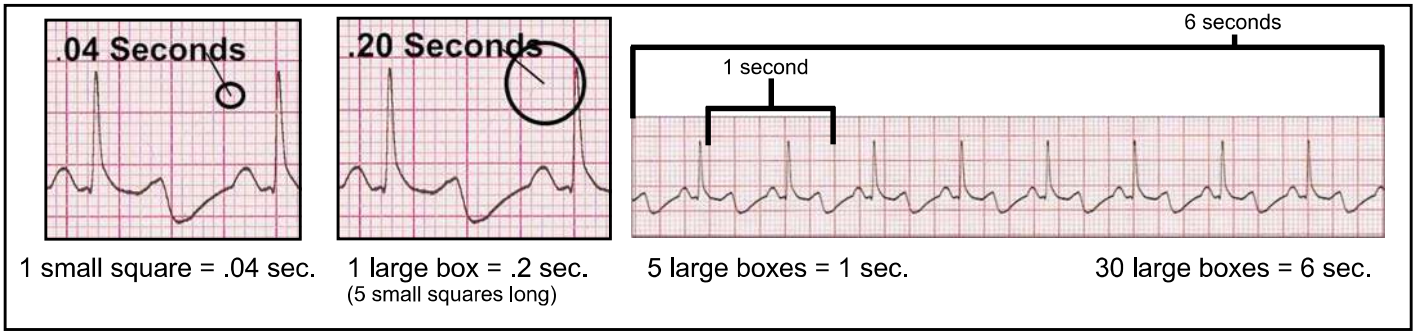
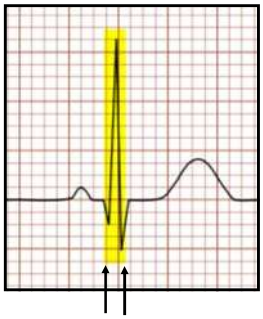
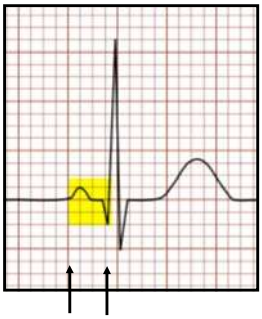
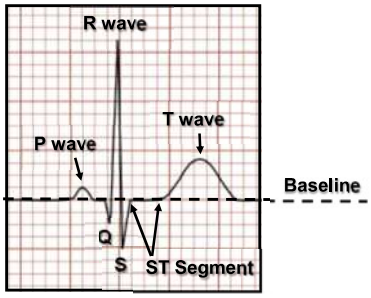




QRS Complex-
Normal is 0.04 - 0.12 sec.
(1-3 small boxes)



PR Interval-
Normal is 0.12 - 0.20 sec.
(3-5 small boxes)



ST Segment-
Normally level with baseline. If higher, possible ST elevation MI. 12 lead ECG is needed to properly evaluate ST elevation.

Normal Sinus Rhythm

Rhythm: Regular
Rate: 80 bpm (normal range= 60-100 bpm)
P Waves: Upright and regular
P-R Interval: 0.16 sec (normal range= 0.12-0.20), one P wave for each QRS
QRS: 0.08 sec (normal range= 0.04-0.12)

Clinical Significance: Unless the patient has no pulse or other serious signs or symptoms, there is no significance to this cardiac rhythm.

Dysrhythmias Originating in the SA Node

Sinus Bradycardia

Rhythm: Regular
Rate: 50 bpm (normal range= 60-100 bpm)
P Waves: Upright and regular
P-R Interval: 0.16 sec (normal range= 0.12-0.20), one P wave for each QRS
QRS: 0.08 sec (normal range= 0.04-0.12)

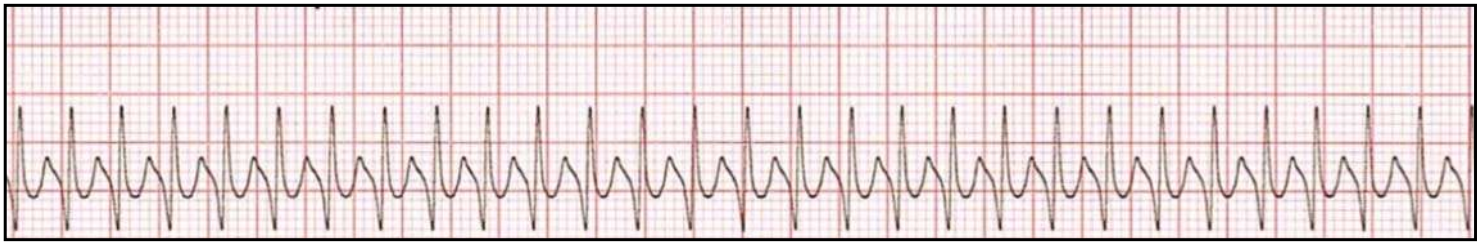
Clinical Significance: A decreased heart rate can result in decreased cardiac output, hypotension, or other serious problems depending on the cause of the bradycardia. Unless the patient has hypotension or other serious signs or symptoms, no treatment is necessary. For hypotension or other serious symptoms, Atropine 0.5mg can be given every 3-5 minutes. If atropine is ineffective, transcutaneous pacing should be done. Other treatments include Dopamine 2 to 20 mcg/kg per minute or Epinephrine 2 to 10 mcg/min.

Sinus Tachycardia

Rhythm: Regular
Rate: 130 bpm (normal range= 60-100 bpm)
P Waves: Upright and regular
P-R Interval: 0.16 sec (normal range= 0.12-0.20), one P wave for each QRS
QRS: 0.04 sec (normal range= 0.04-0.12)

Clinical Significance: Typically sinus tachycardia needs no treatment. It is most often a compensatory mechanism to an underlying cause such as fever, anxiety, hypovolemia, or shock. It is most important to identify and treat the underlying cause as needed. Rates less than 150bpm do not usually cause serious signs and symptoms. Rates over 150bpm may cause reduced cardiac output and may require treatment. Synchronized cardioversion is the first choice. If regular narrow QRS complex, consider adenosine.

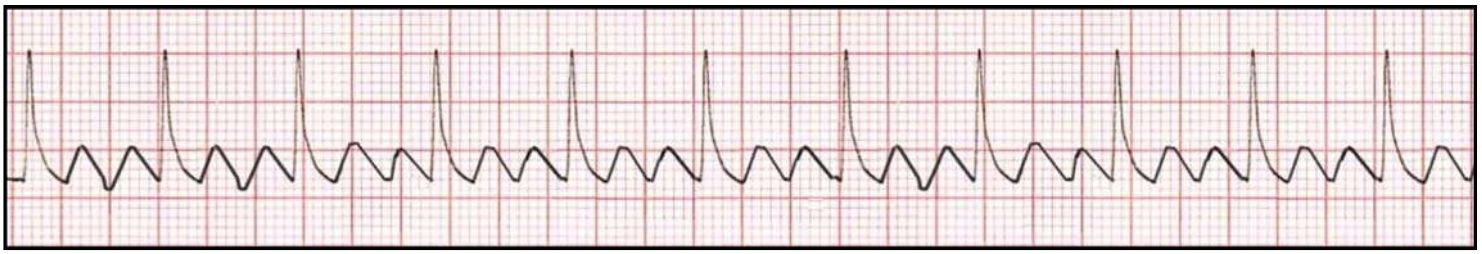
Dysrhythmias Originating in the Atria



Supraventricular Tachycardia

Rhythm: Regular
Rate: 280 bpm (SVT is defined as >100bpm. Typically under 150bpm has no symptoms.)
P Waves: Present but difficult to see on the end of the T wave because of rapid rate
P-R Interval: 0.12 sec (normal range= 0.12-0.20), one P wave for each QRS, again difficult to see
QRS: 0.04 sec (normal range= 0.04-0.12)

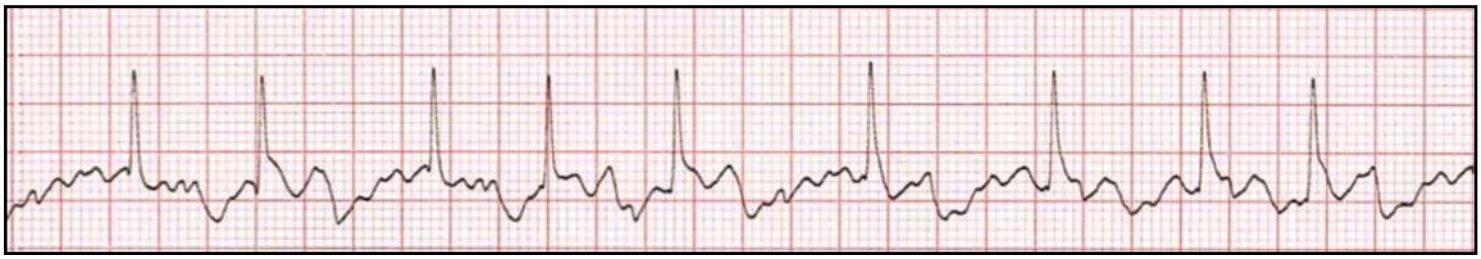
Clinical Significance: SVT usually has an abrupt onset and termination in patients with high levels of stress, over exertion, high levels of caffeine, Wolff-Parkinson-White (WPW) syndrome, etc... and can usually be tolerated for short periods of time. Runs of SVT are often felt as palpitations. Treatment is not normally needed for self-terminating SVT. If the patient is unstable, rapid treatment must be given to correct the SVT. Synchronized cardioversion at 50-100 joules with a monophasic or biphasic defibrillator should be given immediately. For symptomatic, but stable SVT, Vagal maneuvers should be tried first. If unsuccessful, then 6mg Adenosine rapid IV push would be given. 12mg Adenosine may be tried if the first dose did not convert the rhythm.



Atrial Flutter

Rhythm: Regular (Can be irregular)
Rate: 110 bpm (Atrial rate is 210. Typical “sawtooth” pattern of atrial flutter.)
P Waves: Flutter waves, or F waves, are present.
P-R Interval: F waves are consistent, 2 for every QRS (2:1 or 3:1 is typical)
QRS: 0.12 sec (normal range= 0.04-0.12)

Clinical Significance: Treatment is not normally necessary. Rather an expert consultation is required. Patients will often feel weak or dizzy. Treatment is necessary if there is a rapid ventricular rate that creates hemodynamic instability. For an unstable patient, perform synchronized cardioversion with 50 to 100 J with a monophasic or biphasic defibrillator. Pharmacologic therapy should be done only upon expert consultation or medical control direction.

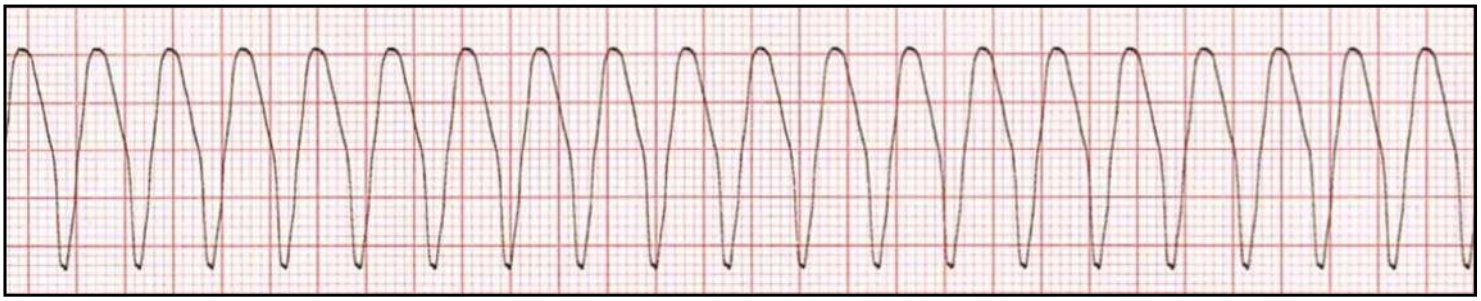


Atrial Fibrillation

Rhythm: Irregular
Rate: 90 bpm (Atrial rate is very fast and chaotic, and cannot be counted) *P Waves:* Not discernible. Chaotic.
P-R Interval: None
QRS: 0.08 sec (normal range= 0.04-0.12)

Clinical Significance: Treatment is not normally necessary. Rather an expert consultation is required. Patients will often feel weak or dizzy. For an unstable patient, perform synchronized cardioversion with 200 Joules with a monophasic or 120 to 200 joules with a biphasic defibrillator. Pharmacologic therapy should be done only upon expert consultation or medical control direction.

Dysrhythmias Originating in the Ventricles



Ventricular Tachycardia (V-tach)

Rhythm: Regular (Can be slightly irregular)
Rate: 200 bpm (Typically between 100-250)
P Waves: Absent
P-R Interval: Absent
QRS: Wide, 0.32 sec (usually wide and bizarre)

Clinical Significance: Ventricular tachycardia severely compromises cardiac output and coronary artery perfusion. V-tach May be perfusing or non-perfusing. If there is a pulse and patient is stable, then Procainamide or Amiodarone may be administered. If unstable with a pulse, then synchronized cardioversion is needed. If pulseless, then defibrillate with an initial unsynchronized dose of 360 joules monophasic or 120-200 joules biphasic.

Torsade's De Pointes

Rhythm: 210
Rate: Irregular
P Waves: Absent
P-R Interval: Absent
QRS: Wide

Clinical Significance: A person with Torsade's will be unstable, but may present with or without a pulse. Torsade's is a polymorphic ventricular tachycardia with the characteristic illusion of a twisting of the QRS complex around the baseline. Magnesium Sulfate should be administered. Either should be treated as with V-fib.

Ventricular Fibrillation (V-fib)

Rhythm: Chaotic
Rate: Chaotic
P Waves: Absent
P-R Interval: Absent
QRS: Absent

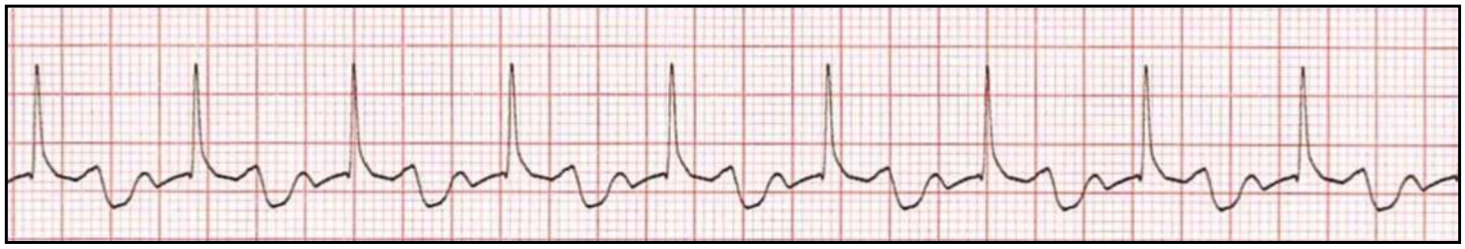
Clinical Significance: Ventricular fibrillation is lethal with no cardiac output. Defibrillate with an initial unsynchronized dose of 360 joules monophasic or 120-200 joules biphasic. 1mg Ephinephrine 1:10,000 is the drug of choice given every 3-5 minutes.

Asystole

Rhythm: None
Rate: None
P Waves: Absent
P-R Interval: Absent
QRS: Absent

Clinical Significance: Asystole is cardiac arrest with no electrical activity. Treat with high quality CPR and 1mg Epinephrine 1:10,000 given every 3-5 minutes. Try to correct underlying causes such as H's and T's.

Atrioventricular (AV) Heart Blocks



First-Degree AV Block

Rhythm: Regular (can be slightly irregular)
Rate: 90
P Waves: Normal
P-R Interval: 0.24 sec (normal range= 0.12-0.20), one P wave for each QRS
QRS: 0.04 sec (normal range= 0.04-0.12)

Clinical Significance: The prolonged P-R interval with one P wave for each QRS is the most identifiable sign to recognize first-degree AV block. Although first-degree block is not usually serious by itself, it can be a precursor to a more serious type of block. Usually treatment is not needed unless other serious signs or symptoms are evident.

Second-Degree AV Block Mobitz Type I – Wenckebach

Rhythm: Ventricular rhythm is irregular; Atrial rhythm is Regular
Rate: 70 (typically normal or slow)
P Waves: Normal; Some are not followed by QRS complexes
P-R Interval: Becomes progressively longer until QRS is dropped.
QRS: 0.04 sec (usually within normal range= 0.04-0.12)

Clinical Significance: If beats are frequently dropped, cardiac output can be compromised. This can cause syncope and angina. Usually treatment is not needed immediately unless other serious signs or symptoms are evident. If symptomatic bradycardia occurs, then 0.5mg of Atropine should be administered IV. If atropine fails, transcutaneous pacing should be administered.

Second-Degree AV Block Mobitz Type II

Rhythm: Ventricular rhythm is irregular; Atrial rhythm is Regular
Rate: 60 (typically bradycardic)
P Waves: Normal; Some are not followed by QRS complexes
P-R Interval: Constant for p-waves followed by a QRS
QRS: 0.04 sec (can be longer than normal range= 0.04-0.12)

Clinical Significance: Regular P-waves with a regular P-R interval and occasional dropped QRS complexes is the most identifiable characteristic of second-degree AV block type II. If beats are frequently dropped, cardiac output can be compromised. This can cause syncope and angina. Usually treatment is not needed immediately unless other serious signs or symptoms are evident. If symptomatic bradycardia occurs, then transcutaneous pacing should be the first choice. Atropine is more likely to be ineffective as it can accelerate the atrial rate but worsen the AV block in a second-degree type II block. Atropine may be used, but with caution.

Third-Degree AV Block

Rhythm: Ventricular rhythm is regular; Atrial rhythm is regular
Rate: 60 (typically bradycardic)
P Waves: Normal; Some are hard to see and buried in QRS complexes
P-R Interval: Varies; disassociated from QRS
QRS: 0.16 sec (normal range is= 0.04-0.12)

Clinical Significance: A third degree block is an absence of conduction between the atria and the ventricles. There is a complete electrical block between the two and they pace the heart independent of each other. Cardiac output is severely compromised. If symptomatic bradycardia is present, then transcutaneous pacing should be the first choice. Atropine is more likely to be ineffective as it can accelerate the atrial rate but worsen the AV block in a third-degree block. Atropine may be used, but with caution.