



National Medical Certifications Services, Inc.

**Adult Cardiac Life Support (ACLS)
Recertification Preparatory Materials**



ADULT CARDIAC LIFE SUPPORT (ACLS) RECERTIFICATION

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What is ACLS?

ACLS is an “**assess – then manage**” approach for those at risk of or in cardiac arrest.

Primary and Secondary ABCD's

This is a **methodical “assess-then-manage”** approach used to treat adults in respiratory distress and failure, stable and unstable arrhythmias and pulseless arrest. **Algorithms** are “menus” that guide you through recommended treatment interventions.

Know the following ABCD's approach because it begins all ACLS case scenarios. The information you gather during the assessment will determine which algorithm you choose for the patient's treatment.

I. **Primary ABCDs: these refer to CPR and the AED.**

A. **A** ssess: **Tap and ask: “Are you OK?”**

- A. send someone to call 911 and bring an AED
- B. if alone, call 911, get an AED and return to victim

Airway: Open with the head-tilt/chin lift.

B. **B** reathing: **Assess for adequate breathing.**

1. if inadequate: **give 2 breaths over 1 second each**
2. each breath should **cause a visible chest rise**
3. use mouth-to-mask or barrier, bag – mask - ventilation (**BMV**) or mouth – to – mouth
4. give oxygen (**O₂**) as soon as it is available

C. **C** irculation: **Check carotid pulse for no more than 10 seconds**

1. if not definitely felt, give **30 compressions** in center of chest between the nipples
2. compress the chest wall **1½ - 2 inches**
3. one cycle of CPR is **30 compressions and 2 breaths**
4. **give 5 cycles** of CPR (about 2 minutes)
5. **minimize interruptions** to compressions
6. **2 rescuers:** the compressor **PAUSES** while 2 breaths are given
7. **change compressors after 5 cycles** to avoid fatigue and ineffective compressions

D. **D** e fibrillation: **When an AED arrives, immediately power it on!**

1. **follow the voice** prompts
2. use **adult pads** on adults

II. Secondary ABCDs

A. **A**irway: Use bag – mask connected to 100% O₂

1. give each breath over 1 second each
2. compressor pauses to allow the 2 breaths to go in
3. consider inserting an advanced airway, (see Advanced Airway on page 5)

B. **B**reathing: Look for visible chest rise during each breath

1. **confirm** advanced airway tube placement (see Advanced Airway on page 5)
2. **secure** the airway tube.
3. compressor now gives **100 continuous compressions** per minute
4. ventilator gives **8-10 breaths** per minute (one every 6-9 seconds)

C. **C**irculation: Obtain vascular access with an IV(intravascular) or 10 (intraosseous) cannula

- 1) give drugs as recommended per algorithm.

D. **D**iagnosis: Why is the patient in the rhythm? Look for any possible causes to treat:

6 Hs	5 Ts
H ypoxia	T amponade
H ypovolemia	T ension pneumothorax
H ypothermia	T oxins – poisons, drugs
H ypoglycemia	T hrombosis – coronary (AMI) – pulmonary (PE)
H ypo / H yperkalemia	T rauma
H ydrogen ion (acidosis)	

Airway Skills

I. Basic Airway

A. Oxygen

B. Open the Airway

1. use the **head - tilt chin lift** when assessing for adequate breathing
2. use a **jaw thrust** for unresponsive – unwitnessed, trauma or drowning victims
 - if unable to open the airway with a jaw thrust, use head-tilt chin lift

C. Maintain

1. insert an **oropharyngeal airway** when unconscious with no cough or gag reflex
2. insert a **nasopharyngeal airway** when a cough or gag reflex is present (better tolerated)

D. Ventilate: give each breath over 1 second using enough volume to see the chest rise

1. **2-rescuer CPR: give 2 breaths during the pause** following 30 compressions
2. **Rescue breathing:** when a pulse is present, give **10-12 breaths/minute** (one each 5-6 seconds)

II. Advanced Airway

A. Laryngeal Mask Airway (LMA): requires the least training for insertion

1. inserts blindly into the hypopharynx
2. regurgitation and aspiration are reduced but not prevented
3. confirm placement: see chest rise and listen for breath sounds over lung fields
4. contraindications: gastric reflux, full stomach, pregnancy or morbid obesity

B. Combitube: requires more training for insertion than the LMA

1. inserts blindly into esophagus (80% of the time) or the trachea
2. ventilation can occur whether the tube is the esophagus or the trachea
3. confirm placement: clinical exam and a confirmation device (see devices)
4. contraindications: gag reflex, esophageal disease, caustic ingestion, under 16 years of age or under 60 inches in height

C. Endotracheal Tube (ETT): requires the most training, skill and frequent retraining for insertion

1. inserts by direct visualization of vocal chords
2. isolates the trachea, greatly reduces risk of aspiration and provides reliable ventilation
3. high risk of tube displacement or obstruction whenever patient is moved
4. confirm placement, clinical exam and a confirmation device (see devices)

D. Confirm tube placement

1. Clinical Assessment

- a. look for bilateral chest rise
- b. listen for breath sounds over stomach and the 4 lung fields (left and right anterior and midaxillary)
- c. look for water vapor in the tube (if seen this is helpful but not definitive)

2. Devices

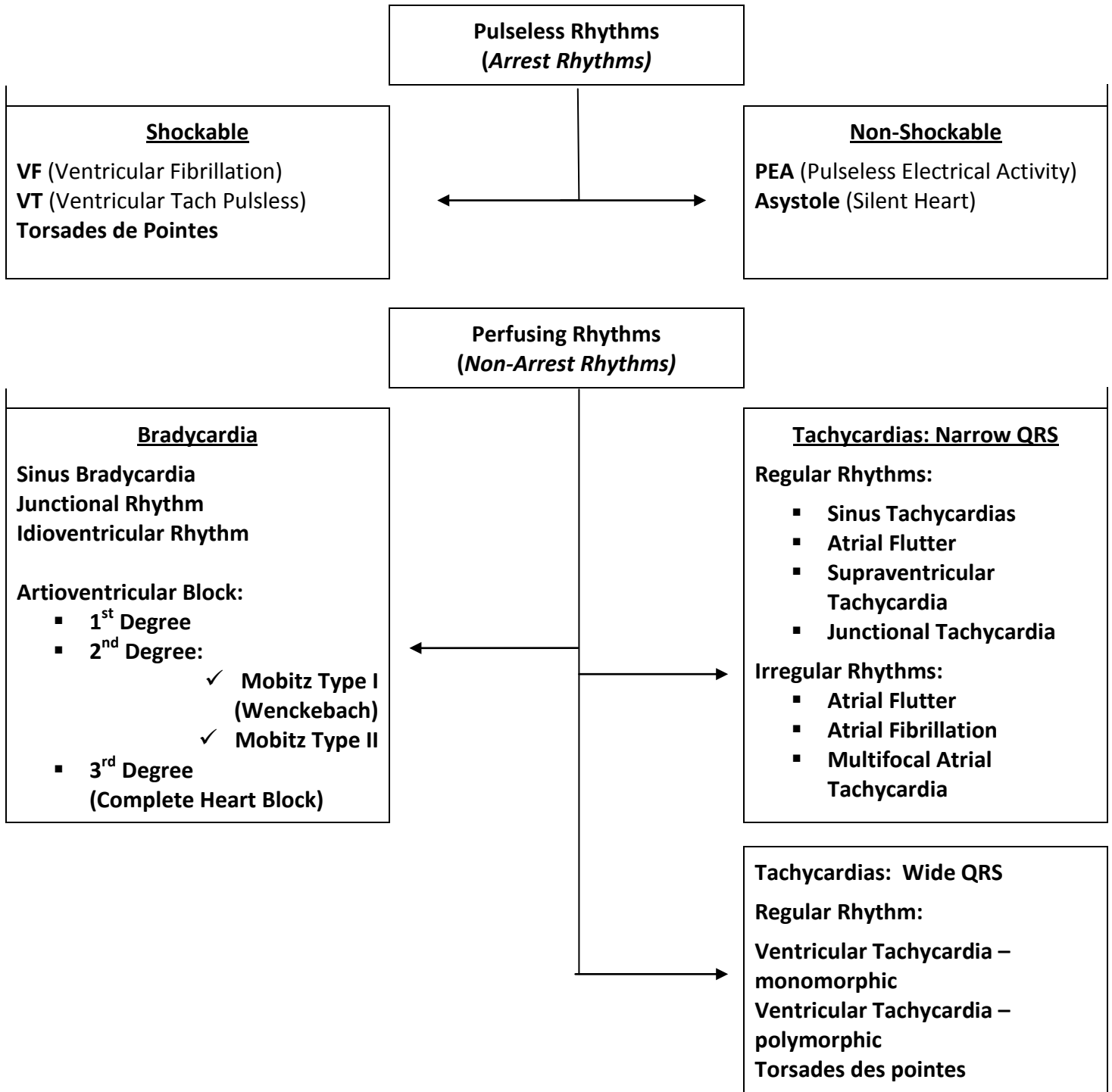
a. End-Tidal CO₂ Detector (ETD): if weight > 2 kg

- i. attaches between the ET and Ambu bag; give 6 breaths with the Ambu bag
- ii. litmus paper center should change color with **each inhalation** and **each exhalation**
 - **original color** on inhalation = OK O₂ is being exhaled: expected
 - **color change** on exhalation = CO₂!! Tube is in trachea
- iii. Trouble shooting: **original color on exhalation** =
 - **litmus paper is wet** replace ETD, or
 - **tube is not in trachea** remove ET, or
 - **cardiac output is low** during CPR

b. Esophageal Detector (EDD): if weight > 20 kg and in a perfusing rhythm

- i. Resembles a turkey baster
 - compress the bulb and attach to end of ET
 - bulb inflates quickly - tube is in the trachea
 - bulb inflates poorly - tube is in the esophagus
- ii. No recommendation for its use in cardiac arrest

Arrhythmias



Electrical Therapy

- I. **Defibrillation:** high energy shocks with manual defibrillator: ECC handbook, p. 9
 - A. recommended shock dose: **biphasic = 120 – 200 J** (per manufacturer)
 - B. recommended shock dose: **monophasic = 360 J**
- II. **Synchronized Cardioversion:** timed low energy shocks: ECC handbook p. 14
 - A. timed to QRS to reduce risk of “R-on-T”: a shock that hits the T wave may cause VF
- III. **Transcutaneous Pacer:** noninvasive emergent bedside pacing: ECC handbook, p. 62
 - A. apply pacer pads
 - B. verify pacer capture

Vascular Access

- ❖ **Peripheral: preferred in arrest due to easy access and no interruption in CPR**
 - A. use a large bore IV catheter
 - B. attempt large veins: antecubital, external jugular, cephalic, femoral
 - C. can take 1-2 minutes for IV drugs to reach the central circulation
 - D. follow IV drugs with a 20 ml bolus of IV fluid and elevate extremity for 10-20 seconds
- ❖ **Intraosseous (IO): inserts into a large bone and accesses the venous plexus**
 - A. may use if unable to obtain intravascular access
 - B. drug delivery is similar to that via a central line
 - C. safe access for fluids, drugs, blood samples
 - D. commercial kits are available for IO access
 - E. drug doses are the same as when given IV
- ❖ **Central Line: not needed in most resuscitations**
 - A. insertion requires interruption of CPR
 - B. if a central line is already in place and patent, it can be used
- ❖ **Endotracheal: some drugs may be given via the ETT in the absence of a IV/IO**
 - A. drug delivery is **unpredictable thus IV/IO delivery is preferred**
 - B. **drug blood concentration stay lower than when given IV**
 - C. increase dose given to 2 – 2.5 times the recommended IV dose
 - D. drugs that absorb **via the trachea**
 - E. **N aloxone**
 - A **tropine**
 - V **asopressin**
 - E **pinephrine**
 - L **idocaine**

ACLS Drugs

- **The primary focus** in cardiac arrest is effective CPR and early defibrillation.
- **Drug administration is secondary** and should **NOT interrupt CPR**.
- Know the timing of drug administration in CPR as shown.
- The Class of Recommendation number denotes potential benefit versus risk.

General Statements:

- ❖ **Pulse arrest, all:** **give a vasopressor drug – Epinephrine or Vasopressin**
Vasopressors cause peripheral vasoconstriction, which shunts increased blood flow to the heart and brain.
- ❖ **Pulseless ventricular rhythms: consider antiarrhythmics – Amiodarone, Lidocaine or Magnesium**
May make myocardium easier to defibrillate and/or more difficult for it to again fibrillate after conversion.
- ❖ **Bradycardia:** **give a “speed up” drug – Atropine**
Atropine blocks vagal input and stimulates the SA node, which can increase heart rate.
 - **Consider** dopamine and epinephrine infusions if unresponsive to atropine and waiting on a pacemaker. Dopamine and epinephrine may increase heart rate but also increase myocardial oxygen demand.
- ❖ **Tachycardia, Reentry SVT:** **give a drug to interrupt the rhythm – Adenosine**
Adenosine blocks the AV node for a few seconds, which may break the re-entry pattern.
- ❖ **Tachycardia, Afib or Aflutter: to convert rhythm – Amiodarone**
to slow rate – beta blocker – Diltiazem
- ❖ **Tachycardia, VT, stable: to convert rhythm – Amiodarone or Synchronized Cardioversion**
- ❖ **Acute Coronary Syndromes: first line treatment is “MONA” ECC**
 - **M**orphine decreases pain not relieved by nitroglycerin; also dilates peripheral vessels decreasing resistance against which the heart has to pump
 - **O**xygen increases the oxygen available to the ischemic or injured heart muscle
 - **N**itroglycerin dilates coronary arteries so more oxygenated blood can reach the muscle and decrease pain; also dilates peripheral vessels decreasing resistance against which the heart has to pump
 - **A**spirin decreases platelet clumping, the first step in forming a new clot***
****If allergic to Aspirin (ASA): give Clopidogrel (Plavix) – affects platelet clumping similar to ASA*

ACLS Core Cases

I. Respiratory Arrest Case

II. VF Treated with CPR and AED Case

You are walking down the hall and the person in front of you suddenly collapses

- **Assess:**

Tap, ask: Are you OK?

No movement or response, call 911 and get the AED!!!

or if a second person is present, send them to call and get the AED

- **Primary ABCD Survey**

Airway: **open and hold** (head tilt – chin lift or Jaw Thrust)

Look, listen & feel

Breathing: **give 2 breaths** (1 second each) that make the chest rise

*avoid rapid or forceful breaths

Circulation: **check carotid pulse – at least 5 but no longer than 10 seconds**

- **begin CPR** if a definite pulse is not felt
- **30 compressions: 2 ventilations = 1 cycle**
- push **hard**: 1 ½ - 2 inches deep
- push **fast**: 100 compressions per minute
- allow the chest wall to completely **recoil** (take weight off hands)
- **minimize interruptions**

recheck pulse after 5 cycles of CPR (approximately 2 minutes)

2 – rescuer CPR, basic airway: **pause** compressions to ventilate

Defibrillation: **Automated External Defibrillator**

1. **Power On** – turn power on (some AEDs automatically turn on)
2. **Attachement – select adult pads**
 - a. attach pads to patient (upper right sterna border and cardiac apex)
 - b. attach cables to AED, if needed
3. **Analysis**
 - a. announce “analyzing rhythm – stand clear!”
 - b. press analyze, if needed
4. **Shock**
 - a. if shock indicated:
 - announce “Shock is indicated. Stand Clear! I’m going to shock.”
 - verify no one is touching the patient
 - press shock button when signaled to do so
 - b. if no shock indicated, follow prompts from AED

www.CPRTrainingFast.com

Unacceptable actions:

- did not provide effective CPR
- did not follow AED's commands
- did not clear patient before shock (unsafe defibrillation)

III. Pulseless Arrest: VF / Pulseless VT Case

You respond to a patient monitor alarm, to find the patient is unresponsive. Call for help and begin CPR (primary ABCD survey). A team member arrives with the crash cart which has a manual defibrillator and advanced equipment. The patient is attached to the monitor and **you identify and verify VT or PVT.**

- **Primary D: Defibrillation: Shock #1**
 1. After verifying the rhythm, **resume CPR** while the defibrillator is charging
 2. once charged, **Clear!!!** ensure that no one is touching the patient or bed
 3. **give 1 shock:** biphasic defibrillators = **manufacturer's recommendation**,
if unknown **200J** monophasic defibrillators = **360J**
 4. **Immediately resume CPR** for 5 cycles
 5. **After 5 cycles:** check rhythm (shockable?), check pulse (5-10 seconds)
- **Secondary ABCD Survey: conducted between 1st and 2nd shock and Ongoing**
 1. **Airway**
 - a. **BVM** with 100% O₂
 - b. consider advanced airway placement: LMA, Combitube or ETT
 2. **Breathing**
 - a. check for visible chest rise with BVM
 - b. confirm advanced airway placement by exam and confirmation device
 - c. secure advanced airway in place with tape or a commercial device
 - d. give 8-10 breaths/min and continuous compressions at 100 per minute
 3. **Circulation: establish vascular access via IV or IO**
 - a. do not interrupt CPR for access
 4. **Differential Diagnosis – use the H's and T's mnemonic**
- **Defibrillation: Shock #2**
 1. after 5 cycles of CPR
 - a. check rhythm (shockable?)
 - b. check pulse (5 - 10 seconds)
 2. resume CPR while defibrillator is charging
 3. once charged, **Clear!!!** ensure no one is touching the patient or bed
 4. **give 1 shock:** biphasic defibrillators = **manufacturer's recommendation**,
if unknown **200J** monophasic defibrillators = **360J**
 5. **immediately resume CPR** for 5 cycles

- **Medications: Administration either:** give during CPR
 1. **epinephrine 1 mg IV/IO** (every 3 – 5 minutes) or
 2. **vasopressin 40U IV/IO** to replace the first or second dose of epinephrine
- **Defibrillation: Shock #3**
 1. after 5 cycles of CPR
 - a. check rhythm (shockable?)
 - b. check pulse (5 - 10 seconds)
 2. resume CPR while defibrillator is charging
 3. once charged, **Clear!!!** ensure no one is touching the patient or bed
 4. **give 1 shock:** biphasic defibrillators = **manufacturer's recommendation**,
if unknown **200J** monophasic defibrillators = **360J**
 5. **immediately resume CPR** for 5 cycles
- **Medications: Consider Antiarrhythmics:** give during CPR
 1. **Amiodarone 300 mg IV/VO once**, then consider additional 150 mg IV/VO once
 2. **Lidocaine 1 – 1.5 mg/kg** first dose then 0.5 – 0.75 mg/kg IV/VO, max 3 doses or 3 mg/kg
 3. **Magnesium 1 – 2 g IV/VO** loading doses for torsades de pointes

Unacceptable actions:

- did not provide effective CPR
- did not clear before shock
- did not confirm advanced airway placement
- did not give a vasopressor

IV. Pulseless Arrest: Pulseless Electrical Activity (PEA) Case

V. Pulseless Arrest: Asystole Case

You find that a patient is unresponsive. Call for help and begin CPR (primary ABCD survey). A team member arrives with a crash cart, which has a manual defibrillator and advanced equipment. The patient is attached to the monitor and **you identify and verify Asystole or PEA.**

- **Primary D: Defibrillation: NO shock indicated for Asystole or PEA**
- **Secondary ABCD Survey: Ongoing**
 1. **BVM** with 100% O₂
 2. consider advanced airway placement: LMA, Combitude or **ETT**
- **Breathing**
 1. check for visible chest rise with BVM
 2. confirm advanced airway placement by exam and confirmation device
 3. secure advanced airway in place with tape or a commercial device
 4. give 8-10 breaths/min and continuous compressions at 100 per minute
- **Circulation: establish vascular access via IV or IO**
 1. do not interrupt CPR for access

- **Medication: give a vasopressor**
 1. **Epinephrine 1 mg IV/VO** (repeat every 3 – 5 minutes)
 2. **Vasopressin 40 U IV/VO** to replace first or second dose of epinephrine
 3. **consider Atropine 1 mg for Asystole or PEA rate less than 60**
 4. **check rhythm, check pulse after 2 minutes of CPR (5 cycles)**
- **Differential Diagnosis – use the H’s and T’s mnemonic**

6 Hs	5 Ts
H ypoxia	T amponade
H ypovolemia	T ension pneumothorax
H ypothermia	T oxins – poisons, drugs
H ypoglycemia	T hrombosis – coronary (AMI) – pulmonary (PE)
H ypo / H yperkalemia	T rauma
H ydrogen ion (acidosis)	

- **Consider family members**

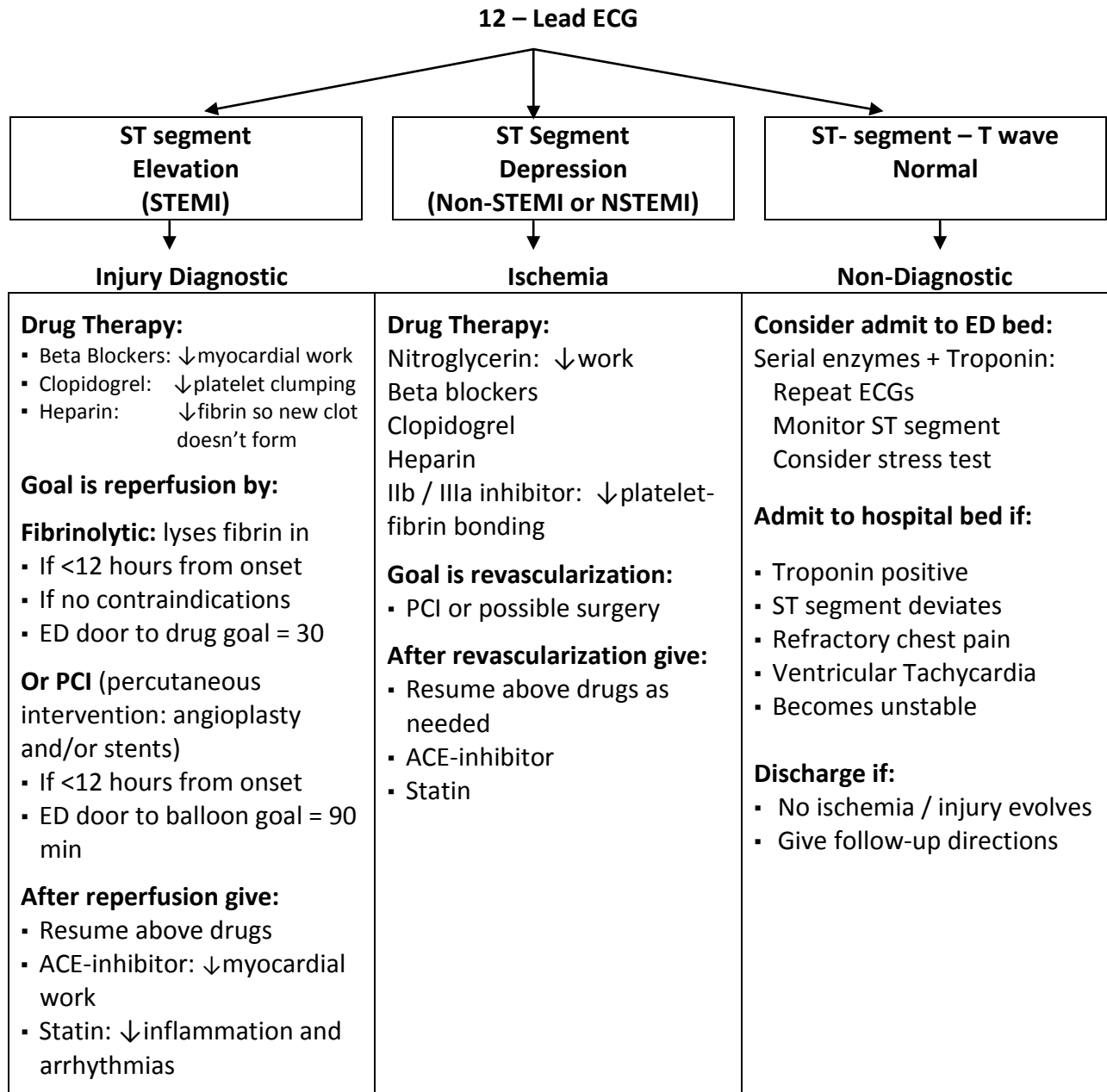
Unacceptable actions:

- did not provide effective CPR
- did not confirm advanced airway placement
- did not give a vasopressor
- did not look for reversible causes to treat
- attempted defibrillation
- attempted transcutaneous pacing for asystole

VI. Acute Coronary Symptoms (ACS) Case

Your neighbor complains of feeling weak and is sweaty, short of breath and slightly nauseated. You are worried this is an acute coronary problem can **call 911**. While waiting for their arrival, you ask if he can take aspirin. He says yes and you have him **chew 2-3 baby aspirin (81 mg)**.

- **EMS Arrival**
 1. Attach monitor, start IV
 2. Give MONA
 3. Obtain 12-lead ECG, if available
 4. Notify hospital and transport
 5. Begin fibrinolytic checklist
- **Arrival at ED: Assess**



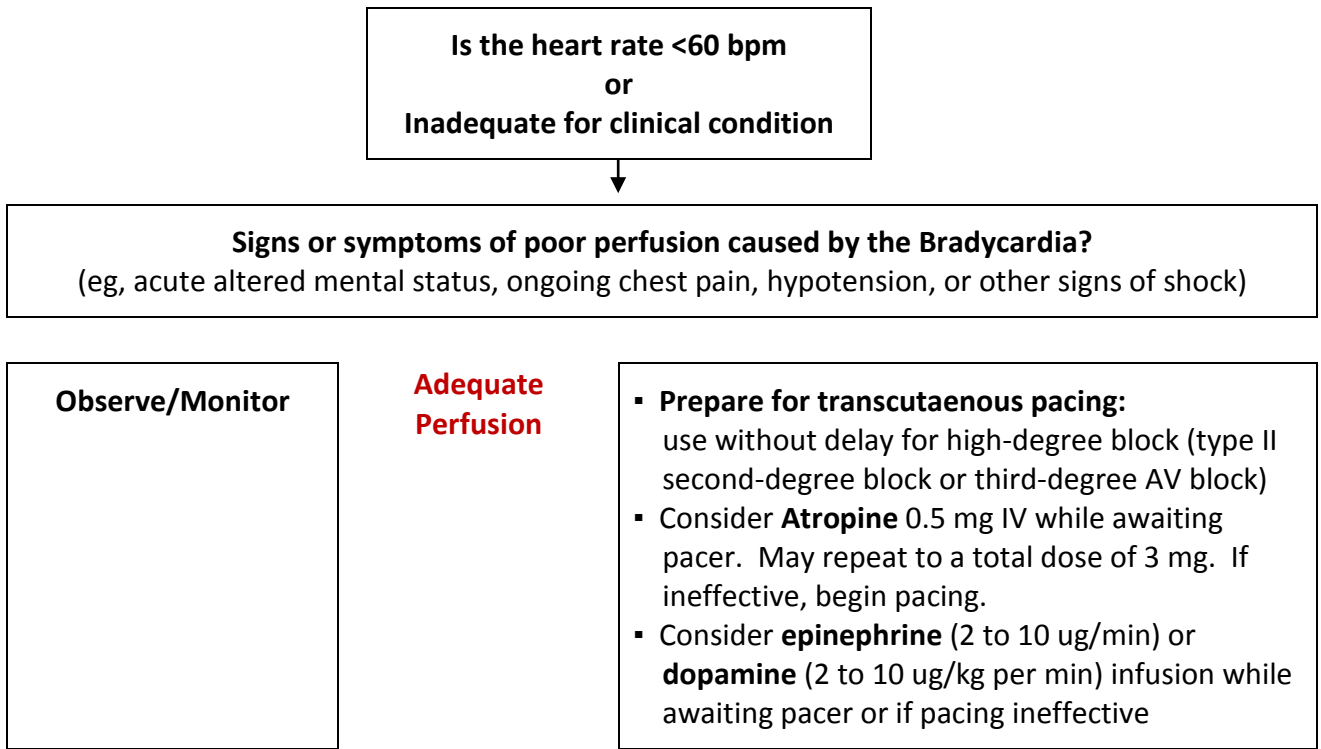
Unacceptable actions:

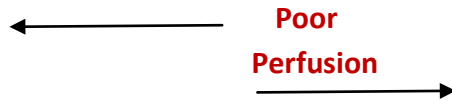
- did not give oxygen and aspirin to a suspected chest pain patient
- did not attempt to control chest pain
- did not obtain 12 - lead ECG

VII. Bradycardia Case

A patient appears pale and complains of dizziness and fatigue. The pulse rate is 56, blood pressure is 86/60 and on the monitor **you identify a bradycardia rhythm.**

- **Primary ABCD Survey:**
 1. Maintain patient **airway**; assist **breathing** as needed
 2. Give **oxygen**
 3. Monitor ECG (identify rhythm), blood pressure, oximetry
 4. Establish IV access
- **Assess rhythm and perfusion:**





Reminders

- If pulseless arrest develops, go to Pulseless Arrest Algorithm
- Search for and treat possible contributing factors:

- Hypovolemia	- Toxins
- Hypoxia	- Tamponade, cardiac
- Hydrogen Ion (acidosis)	- Tension pneumothorax
- Hypo/hyperkalemia	- Thrombosis (coronary or pulmonary)
- Hypoglycemia	- Trauma (hypovolemia, increased ICP)
- Hypothermia	

↓

- Prepare for **transvenous pacing**
- Treat contributing causes
- Consider expert consultation

Unacceptable actions:

- did not identify a high-degree block
- did not initiate TCP immediately for high-degree block
- treated asymptomatic patient as if had poor perfusion

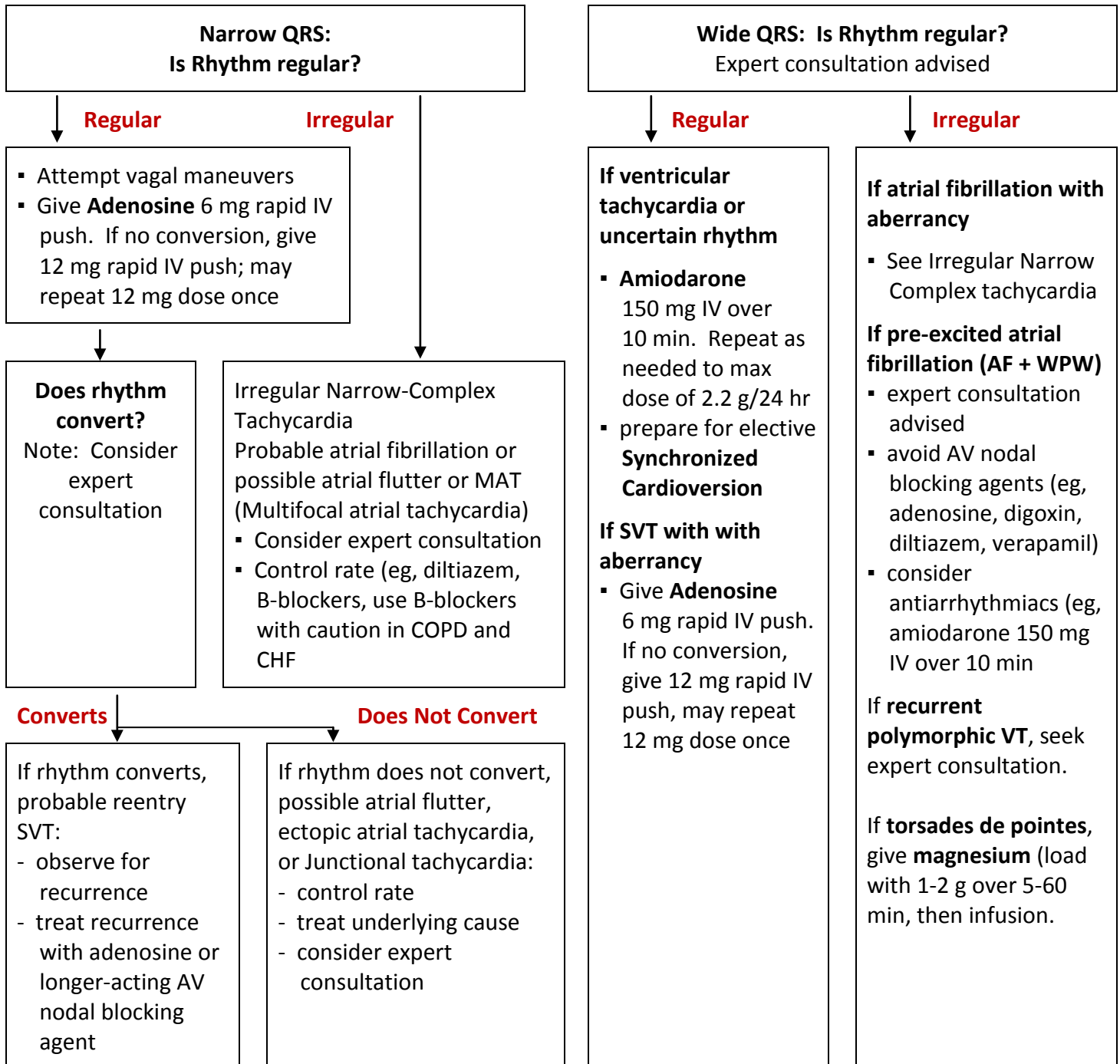
VIII. Unstable Tachycardia Case

IX. Stable Tachycardia Case

A patient appears pale and complains of dizziness and fatigue. The pulse rate is 170, blood pressure is 100/60 and on the monitor **you identify a tachycardia rhythm.**

- **Primary ABCD Survey**
 1. assess and support ABC's as needed
 2. give **Oxygen**
 3. monitor ECG (identify rhythm), blood pressure, oximetry
 4. identify and treat reversible causes
- **Is patient stable?**
 1. unstable signs include altered mental status, ongoing chest pain, hypotension, or other signs of shock
 2. Note: rate-related symptoms uncommon if heart rate <150/min
 3. **Unstable – perform Immediate Synchronized Cardioversion**
 - a. establish IV access and give sedation if patient is conscious: do not delay Cardioversion.
 - b. consider expert consultation
 - c. if pulseless arrest develops, see Pulseless Arrest Algorithm

4. **Stable** – See chart below.
- establish IV access
 - obtain 12-lead ECG (when available or rhythm strip)
 - Is QRS narrow (<0.12 sec)?**



X. Acute Stroke Case

You find a normally alert, active adult in a chair staring blankly at the television and leaning to one side.

- **Identify signs of possible stroke**
 1. **Critical EMS assessments and actions**
 - a. Support ABC's; give **oxygen** if needed
 - b. Perform prehospital stroke assessment:
 - The Cincinnati Prehospital Stroke Scale
 - Facial Droop (have the patient show teeth or smile)
 - Arm Drift (patient closes eyes and extends both arms straight out with palms up, for 10 seconds)
 - Abnormal Speech (have the patient say) "you can't teach an old dog new tricks"
 2. establish time when patient last known normal (symptoms onset)
 3. transport; consider triage to a center with a stroke unit if appropriate; consider bringing a witness, family member or caregiver
 4. alert hospital
 5. check glucose if possible
- **ED Arrival: Immediate general assessment and stabilization ≤10 min**
 1. assess ABC's, vital signs
 2. provide **oxygen** if hypoxemic
 3. obtain IV access and blood samples
 4. check glucose; treat if indicated
 5. perform neurologic screening assessment
 6. activate stroke team
 7. order emergent Non-contrast CT scan of brain
 8. obtain 12-lead ECG
- **ED Arrival: Immediate neurologic assessment by stroke team ≤ 25 min**
 1. review patient history
 2. establish symptom onset
 3. perform neurologic examination (NIH Stroke Scale)
- **Does CT scan show any hemorrhage? ≤45 min**
 1. **Hemorrhage** – consult neurologist or neurosurgeon; consider transfer
 2. **No hemorrhage**
 - Probable acute ischemic stroke; consider fibrinolytic therapy**
 - a. check for fibrinolytic exclusions
 - b. repeat neurologic exam: are deficits rapidly improving?

3. **Patient remains candidate for fibrinolytic therapy?**
 - a. **Not a candidate**
 - administer **aspirin**
 - b. **Candidate ≤ 60 min**
 - **Review risks / benefits with patient and family:**
 - **If acceptable –**
 - **Give tPA**
 - No anticoagulants or antiplatelet treatment for 24 hours