SECTION: Adult Cardiovascular Emergencies

REVISED: 06/2017

Section 2

ADULT CARDIOVASCULAR EMERGENCIES

1.	**Medical – Chest Pain – Cardiac Suspected**	**Protocol 2 - 1**
2.	**Medical – ST Elevation Myocardial Infarction** *(ACS/AMI)*	**Protocol 2 - 2**
3.	**Medical – Pulmonary Edema/CHF**	**Protocol 2 - 3**
4.	**Medical – Hypotension/Shock (Non-trauma)** *(Cardiogenic Shock)*	**Protocol 2 - 4**
5.	**Medical – Abdominal Aortic Aneurysm/Dissection** *(Aortic Dissection & AAA)*	**Protocol 2 - 5**
6.	**Cardiac Arrest – Unknown Rhythm (i.e. BLS)**	**Protocol 2 - 6**
7.	**General – Cardiac Arrest**	**Protocol 2 - 7**
8.	**Medical – Supraventricular Tachycardia (including atrial fibrillation)** **Medical – Tachycardia** **Medical – Ventricular Tachycardia with a Pulse**	**Protocol 2 - 8**
9.	**Medical - Bradycardia**	**Protocol 2 - 9**

This page intentionally
left blank.

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – Chest Pain – Cardiac Suspected

REVISED: 07/2017

Protocol 2-1

NON-TRAUMATIC CHEST DISCOMFORT

OVERVIEW:
Non-traumatic chest discomfort is a common pre-hospital patient complaint. It always should be considered life-threatening until proven otherwise. The discomfort may be caused by acute myocardial infarction (AMI) or angina pectoris, which is a sign of inadequate oxygen supply to the heart muscle. Risk factors which increase the likelihood of heart disease include > 50 years of age, history of hypertension, diabetes mellitus, hypercholesterolemia, smoking, and strong family history of coronary artery disease.

HPI	Signs and Symptoms	Considerations
• Age • Medications • PMH (MI, Angina, DM, HTN) • Allergies (ASA, Morphine) • Recent physical exertion • Onset • Quality (crushing, sharp, dull, constant, etc.) • Region/ Radiation / Referred • Severity (1 - 10) • Time (duration / repetition) • Erectile dysfunction medications such as: Viagra® (Sildenafil), Levitra® (Vardenafil), Cialis® (tadalafil)	• CP (pressure, aching, burning, indigestion and / or tightness) • Location (sub-sternal, epigastric, arm, jaw, neck, shoulder) • Radiation of pain • Pale, diaphoresis • Shortness of breath • Nausea, vomiting, dizziness • Non-specific illness	• Trauma vs. Medical • Angina vs. MI • Pericarditis • Mitral valve prolapse • Pulmonary embolism • Asthma / COPD • Pneumothorax • Aortic dissection or aneurysm • GI reflux, hiatal hernia • Esophageal spasm • Chest wall injury or pain • Pleural pain • Musculo-skeletal pain

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
3. Treat dysrhythmias. Be prepared to initiate CPR and defibrillation, if necessary.	•	•	•	•	•
4. Administer supplemental oxygen to maintain *SPO$_2$* 94 - 99%	•	•	•	•	•
5. Obtain patient history. Reassure the patient.	•	•	•	•	•
6. Place patient on cardiac monitor.		•	•	•	•
a. Obtain a *12 lead ECG*, <10 minutes of pt arrival.		•	•	•	•

Protocol 2-1 Continued

NON-TRAUMATIC CHEST DISCOMFORT

	EMR	EMT	A	I	P
b. Consider ALS rendezvous, especially when the 12-lead indicates the patient is experiencing a STEMI.		•	•		
c. When a 12 lead ECG indicates **"***ACUTE MI***" notify closest appropriate Emergency PCI center (cath hospital) in < 5 minutes.**		•	•	•	•
7. Transport as soon as feasible.		•	•	•	•
8. Administer *ASPIRIN* 324 mg to **chew**.		•	•	•	•
9. Establish an IV of normal saline at KVO.			•	•	•
10. If history consistent with cocaine associated chest pain and 12 lead not indicative of STEMI, administer *MIDAZOLAM* 5 mg IV. Alternatively administer *DIAZEPAM* 2.5 - 5 mg IV. Skip to step 14				•	•
11. Administer *NITROGLYCERIN*.					
a. Assist patient with PRESCRIBED NITROGLYCERIN. If the pain persists and B/P > 100 mmHg systolic, repeat nitroglycerin 0.4 mg SL in 3 to 5 minutes (up to total of three SL doses).		•	•	•	•
b. Administer nitroglycerin 0.4 mg SL. If the pain persists and B/P > 100 mmHg systolic, repeat nitroglycerin 0.4 mg SL in 3 to 5 minutes (up to total of three SL doses).			•	•	•
12. If pain persists following administration of nitroglycerin SL, apply one (1) inch of nitroglycerin paste.			•	•	•
13. If pain persists following administration of a minimum of 3 SL nitroglycerin and nitroglycerin paste, consider *FENTANYL* titrated to pain relief at 1 mcg / kg IV/IM, not to exceed 100 mcg per single dose. May repeat every 10 minutes. Alternatively, administer *MORPHINE* 0.1 mg / kg IV at 1 mg / min., not to exceed 10 mg, titrated to effect.				•	•
14. Transport to appropriate hospital. Patients with ECGs consistent with STEMI should be transported *ONLY* to PCI CAPABLE HOSPITALS.		•	•	•	•
15. Transport and perform ongoing assessment as indicated.	•	•	•	•	•

Acute Cocaine Toxicity

If 12-lead ECG does not indicate AMI and chest discomfort due to cocaine is suspected per HPI, administer Midazolam 5 mg slow IVP, or alternatively Valium 2.5 – 5.0 mg slow IVP.

NON-TRAUMATIC CHEST DISCOMFORT

Cardiac Causes of Chest Discomfort	
Ischemic	Non-Ischemic
• Angina • Myocardial infarction • Aortic stenosis • Hypertrophic cardiomyopathy • Coronary vasospasm	• Pericarditis • Aortic dissection • Mitral valve prolapse

Non-Cardiac Causes of Chest Discomfort			
Gastro-esophageal	Pulmonary	Musculoskeletal	Dermatologic
• Reflux esophagitis • Esophageal spasm • Esophageal perforation • Gastritis • Peptic ulcer disease	• Pneumothorax • Pulmonary embolism • Pleuritis • Neoplasm • Bronchitis	• Costochondritis • Rib fracture • Compression radiculopathy	• Herpes zoster

Lead	Elevation	Reciprocal Depression
SEPTAL	**V1, V2**	**NONE**
ANTERIOR	**V3, V4**	**NONE**
ANTERO-SEPTAL	**V1, V2, V3, V4**	**NONE**
LATERAL	**I, aVL, V5, V6**	**II, III, aVF**
ANTERO-LATERAL	**I, aVL, V3, V4, V5, V6**	**II, III, aVF**
INFERIOR	**II, III, aVF**	**I, aVL**
INFERO-LATERAL	**II, III, aVF, V5, V6**	**I, aVL, V1, V2**
POSTERIOR	**NONE**	**V1, V2, V3, V4**

PEARLS:

1. Many patients with an acute coronary syndrome do not have classic textbook symptoms. As age progresses, chest discomfort declines in frequency as the presenting symptom.
2. Women are more likely to have atypical presentations. Do not overlook vague complaints such as discomfort in the epigastric area, shortness of breath, back, jaw, and heartburn.
3. Ongoing chest discomfort that has been present for an extended period of time may still represent angina. Further questioning may reveal that the pain is actually intermittent since onset rather than constant.
4. Although most acute MI develop ECG changes, up to 1/3 do not develop any changes at all.

NON-TRAUMATIC CHEST DISCOMFORT

5. Do not attribute cardiac symptoms to other chronic underlying conditions, (i.e. hiatal hernia or esophageal spasm) without a thorough assessment. A new cardiac condition may have developed.

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – ST Elevation Myocardial Infarction (STEMI)

REVISED: 06/2017

Protocol 2-2

ACS / AMI

OVERVIEW:

Prompt diagnosis and treatment offers the greatest potential benefit for myocardial salvage in the first hours of STEMI; and early, focused management of unstable angina and NSTEMI reduces adverse events and improves outcome. Thus, it is imperative that healthcare providers recognize patients with potential ACS in order to initiate the evaluation, appropriate triage, and management as expeditiously as possible; in the case of STEMI, this recognition also allows for prompt notification of the receiving hospital and preparation for emergent reperfusion therapy. Potential delays to therapy occur during 3 intervals: from onset of symptoms to patient recognition, during prehospital transport, and during emergency department (ED) evaluation.

HPI	Signs and Symptoms	Considerations
• Age • Medications • PMH (MI, Angina, DM, HTN) • Allergies (ASA, Morphine) • Recent physical exertion • Onset • Quality (crushing, sharp, dull, constant, etc.) • Region / Radiation / Referred • Severity (1 - 10) • Time (duration / repetition) • Viagra®, Levitra®, Cialis®	• CP (pressure, aching, and / or tightness) • Location (sub-sternal, epigastric, arm, jaw, neck, shoulder) • Radiation of pain • Pale, diaphoresis • Shortness of breath • Nausea / vomiting, dizziness • Non-specific illness	• Trauma vs. Medical • Angina vs. MI • Pericarditis • Pulmonary embolism • Asthma / COPD • Pneumothorax • Aortic dissection or aneurysm • GI reflux, hiatal hernia • Esophageal spasm • Chest wall injury or pain • Pleural pain

Lead	Elevation	Reciprocal Depression
SEPTAL	**V1, V2**	**NONE**
ANTERIOR	**V3, V4**	**NONE**
ANTERO-SEPTAL	**V1, V2, V3, V4**	**NONE**
LATERAL	**I, aVL, V5, V6**	**II, III, aVF**
ANTERO-LATERAL	**I, aVL, V3, V4, V5, V6**	**II, III, aVF**
INFERIOR	**II, III, aVF**	**I, aVL**
INFERO-LATERAL	**II, III, aVF, V5, V6**	**I, aVL, V1, V2**
POSTERIOR	**NONE**	**V1, V2, V3, V4**

Protocol 2-2 Continued

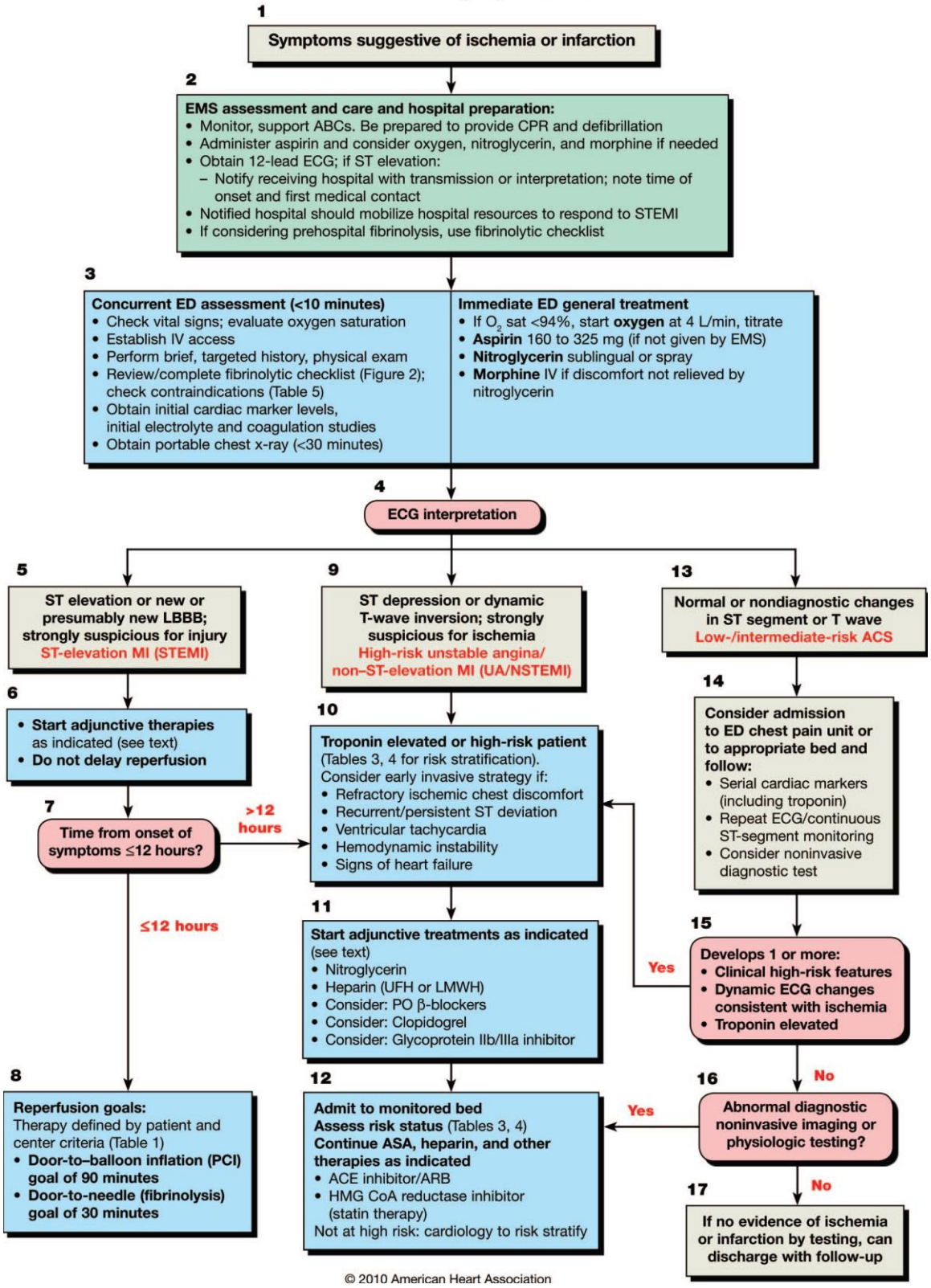
ACS / AMI

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
3. Administer oxygen to maintain SPO_2 94 - 99%	•	•	•	•	•
4. Establish an IV of normal saline per patient assessment.			•	•	•
5. Obtain 12 lead ECG.		•	•	•	•
a. If 12 lead reads, "***AMI***, the patient should be immediately transported to the closest PCI capable hospital. AIC must notify receiving facility ASAP.		•	•	•	•
b. If 12 lead is consistent with STEMI, and capability exists, transmit 12 lead to PCI center.		•	•	•	•
6. Transport immediately.		•	•	•	•
a. If actual transport time is greater than 45 minutes to a PCI center, consider use of aeromedical.		•	•	•	•
7. Place patient on cardiac monitor and monitor pulse oximetry.				•	•
8. If no contraindications, administer ASA 324 mg PO.	•	•	•	•	•
9. If confirmed STEMI and/or significant cardiac history, administer ***NITROGLYCERIN*** 0.4 mg SL. If the pain persists and B/P > 100 mmHg systolic, repeat nitroglycerin 0.4 mg SL in 3 to 5 minutes (up to total of three SL doses).			•	•	•
10. If pain persists, refer to *General – Pain Control* protocol.	•	•	•	•	•
11. Transport and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

1. Recognized PCI centers in the ODEMSA region include (in alphabetical order): Chippenham Hospital, Henrico Doctors' Hospital (Forest), Memorial Regional Medical Center, Southside Regional Medical Center, St. Francis Medical Center, St. Mary's Hospital, VA McGuire's Medical Center, VCU Medical Center.
2. In right-sided infarctions, a prophylactic fluid bolus will assist with pre-load.
3. Decreasing time from diagnosis to definitive treatment (cath) is essential.
4. Designated Emergency Percutaneous Coronary Intervention Centers will have the service available on a 24 hrs per day basis and will not divert STEMI patients unless there is a catastrophic event affecting hospital operations.
5. Patients who have had ROSC from a cardiac arrest and have an ECG consistent with a STEMI should be transported to the closest Emergency Percutaneous Coronary Intervention Center.

Acute Coronary Syndromes



THIS PAGE LEFT INTENTIONALLY BLANK

Protocol
2-3

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – Pulmonary Edema/CHF

REVISED: 12/2017

HEART FAILURE

OVERVIEW:
Heart failure is generally divided into left ventricular failure and right ventricular failure. Left ventricular heart failure is the inability of the left ventricle to adequately move blood into the systemic circulation. In left ventricular failure, an imbalance in the output of the two sides of the heart occurs. The left ventricle is unable to move all the blood delivered to it from the right side of the heart. Left ventricular followed by left atrial pressure rises and is transmitted back to the pulmonary circulation. When the pressure in the pulmonary vessels becomes too high, blood serum is forced into the alveoli, resulting in pulmonary edema. In right ventricular heart failure the right side of the heart fails to function as an adequate pump, which leads to back pressure which leads to back pressure into the venous circulation. This is most commonly caused by left heart failure, which subsequently progresses to right heart failure. The patient's symptoms should assist in determining left versus right heart failure, or both. Signs of left sided heart failure include rales / crackles, tachypnea while right-sided failure will create JVD, ascites, and peripheral edema. The management goal of patients with HF involves decreasing cardiac workload by reducing both preload and afterload.

HPI	Signs and Symptoms	Considerations
• Congestive heart failure • Past medical history • Medications (digoxin, lasix, Bumex) ▪ Erectile dysfunction meds: Cialis® (Tadalafil), Viagra® ▪ (Sildenafil), Levitra® (Vardenafil HCl) • Cardiac history • Myocardial infarction	• Respiratory distress, rales • Apprehension, orthopnea • Jugular vein distention • Pink, frothy sputum • Peripheral pitting edema • Diaphoresis • Tripod positioning • Inability to speak in full sentences • Accessory muscle usage with respiration • Hypotension, shock • Chest pain	• Myocardial Infarction • Asthma • Anaphylaxis • Aspiration • COPD • Pleural effusion • Pneumonia • Pulmonary Embolus • Pericardial Tamponade

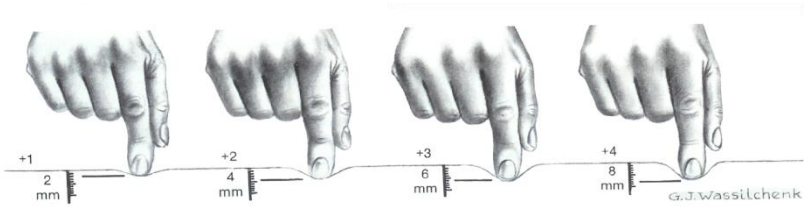
Pulmonary edema with SBP greater than or equal to100 mmHg
If SBP less than 100 mmHg, see *Cardiogenic **SHOCK** protocol*.

Protocol 2-3 Continued

HEART FAILURE

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems.	•	•	•	•	•
3. Administer oxygen to maintain *SPO$_2$* 94 - 99%	•	•	•	•	•
4. *CPAP* is the preferred airway management over endotracheal intubation. Consider intubation for severe respiratory distress / pending respiratory failure.				•	•
5. Transport the patient immediately positioned in an upright position.		•	•	•	•
6. Monitor *pulse oximetry*.	•	•	•	•	•
7. Place patient on cardiac monitor and obtain/interpret *12 lead ECG.*				•	•
8. Establish an IV / lock of normal saline at KVO.			•	•	•
9. Give *NITROGLYCERIN.*					
a. SBP greater than 180: Give *NITROGLYCERIN,* 2 tablets, 0.4 mg SL and 2 inches of Nitropaste 2%. If respiratory distress persists *and* SPB greater than 180 *and* HR greater than or equal to 60 bpm, repeat nitroglycerin, 1 tablets SL every 5 minutes.			•	•	•
b. SBP 100 – 180: Give NITROGLYCERIN, 1 tablet, 0.4 mg SL and 1 inch of Nitropaste 2%. If respiratory distress persists *and* SPB greater than or equal to 100 mmHg *and* HR greater than or equal to 60 bpm, repeat nitroglycerin, 1 tablet SL every 5 minutes.			•	•	•
10. If available, administer CPAP with 5 - 10 cmH_20 PEEP. If no CPAP available, continue with next step.		•	•	•	•
11. If obvious pulmonary edema noted on exam, consider *LASIX* 0.5 – 1.0 mg / kg slow IVP, if systolic BP > 90 mmHg.				•	•
12. If wheez*ing is present, consider bronchodilator therapy, ALBUTEROL* 5.0 mg and *ATROVENT* 0.5 mg via nebulizer with 6 - 8 liters of Oxygen. Treatment should only be administered ONCE.			•	•	•
13. Consider *FENTANYL* titrated to pain relief at 1 mcg / kg IV/IM, not to exceed 50 mcg per single dose. May repeat every 10 minutes.			•	•	•
14. Transport and perform ongoing assessment as indicated.		•	•	•	•

Assessment of Edema			
+1	Slight pitting, disappears rapidly (2 mm)	+2	Deeper pit, disappears in 10 - 15 seconds (4 mm)
+3	Pit is noticeably deep and may last more than a minute. The extremity is fuller and swollen (6 mm)	+4	The pit is very deep, lasts 2 - 5 minutes, and the extremity is grossly distorted (8 mm)



PEARLS:

1. The possibility of myocardial infarction should be assessed in all patients presenting with HF.
2. If the patient is currently taking daily diuretics, double the patient's normal prescribed dose.
3. In left ventricular failure, the apical pulse is usually displaced laterally and downward. There may additionally be a paradoxically split S_2 / S_3 gallop.
4. In right ventricular failure, S_3 is often heard with a holosystolic murmur of tricuspid regurgitation.
5. Advise the receiving facility of CPAP initiation early so they can have CPAP ready on arrival.
6. Upon arrival at hospital, advocate for patient to remain on CPAP and do not remove CPAP until hospital equivalent respiratory therapy is ready to be placed on patient.

This page left intentionally blank.

SECTION: Adult Medical Emergencies

PROTOCOL TITLE: Medical – Hypotension/Shock (Non-trauma) *(Cardiogenic Shock)*

REVISED: 06/2017

Protocol 2-4

CARDIOGENIC SHOCK

OVERVIEW:
Shock is often defined as a state of inadequate tissue perfusion. This may result in acidosis, derangements of cellular metabolism, potential end-organ damage, and death. Early in the shock process, patients are able to compensate for decreased perfusion by increased stimulation of the sympathetic nervous system, leading to tachycardia and tachypnea. Later, compensatory mechanisms fail, causing a decreased mental status, hypotension, and death. Early cellular injury may be reversible if definitive therapy is delivered promptly.

HPI	Signs and Symptoms	Considerations
• Blood loss (vaginal or gastrointestinal) • AAA, ectopic • Fluid loss (vomiting, diarrhea) • Fever • Infection • Cardiac ischemia (MI, HF) • Medications • Allergic Reaction • Pregnancy	• Restlessness, confusion • Weakness, dizziness • Weak, rapid pulse • Pale, cool, clammy skin • Delayed capillary refill • Difficulty breathing • Hypotension • Coffee-ground emesis • Tarry stools	• Shock • Hypovolemic • Cardiogenic • Septic • Neurogenic • Anaphylactic • Ectopic pregnancy • Dysrhythmia • Pulmonary embolus • Tension pneumothorax • Medication effect, overdose • Vaso-vagal • Physiologic (pregnancy)

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Assess mechanism of injury and / or nature of illness.	•	•	•	•	•
3. Administer Oxygen to maintain *SPO_2* 94 - 99%	•	•	•	•	•
4. If shock is present, without pulsating masses, refer to *Shock protocol.*	•	•	•	•	•
5. Obtain *12 lead ECG*		•	•	•	•
a. Place patient on cardiac monitor and interpret				•	•
6. Initiate IV of Normal Saline KVO. Establish second IV if time permits.			•	•	•
7. Administer Normal Saline 20 mL / kg bolus twice. Caution should be used in patients with a history of renal failure and HF. Reassess for overload.			•	•	•

Protocol
2-4
Continued

CARDIOGENIC SHOCK

	EMR	EMT	A	I	P
8. If patient has not responded to boluses, contact medical control to consider the administration of *LEVOPHED 0.1-0.*5 mcg/kg/min for hypotension that remains after fluid bolus. Titrate to maintain adequate peripheral perfusion.				•	•
9. Transport promptly in position of comfort. Reassess as needed.		•	•	•	•

Classes of Shock			
Hypovolemic	**Distributive**	**Cardiogenic**	**Obstructive**
Caused by hemorrhage, burns, or dehydration.	Maldistribution of blood, caused by poor vasomotor tone in neurogenic shock, sepsis, anaphylaxis, severe hypoxia, or metabolic shock.	Caused by necrosis of the myocardial tissue, or by arrhythmias.	Caused by impairment of cardiac filling, found in pulmonary embolism, tension pneumothorax, or cardiac Tamponade.

PEARLS:

1. Circulatory failure is due to inadequate cardiac function.
2. Cardiogenic shock should be considered when an MI is suspected and there is no specific indication of volume related shock.
3. Pulmonary edema / HF may cause cardiogenic shock.
4. Marked, symptomatic tachycardia and bradycardia will cause cardiogenic shock.

Protocol
2-5

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – Abdominal Aortic Aneurysm/ Dissection

(Aortic Dissection and AAA)

REVISED: 12/2017

AORTIC DISSECTION & AAA

OVERVIEW:

Aortic Aneurysms (AA) are a degenerative and progressively slow process where the walls of the aorta weaken and expand due to the systemic pressures of the circulatory system. The formation of aneurysms can be attributed to atherosclerosis, infection, trauma, hypertension, and inherited disorders. AAs generally form in the abdominal section of the aorta and present with weak or absent pulses in the lower extremities, cooler temperatures in the lower extremities, a central abdominal mass that can sometimes have pulsations, and abdominal and/ or back pain. If the aneurysm ruptures, chance of survival is very low and requires immediate surgical intervention. Aortic Dissections usually occur in the thoracic cavity when the aortic intima is torn away, exposing the media layer. The pulse pressure from the systemic circulation then begins to dissect the two layers of the aortic wall and creates a false lumen or pouch in the wall of the aorta. Conditions associated with the formation of an aortic dissection include: hypertension, Marfan's Syndrome, aortic valve abnormalities, immune disorders, atherosclerosis, and patients in the third trimester of pregnancy. When left untreated, about 33% of patients die within the first 24 hours, and 50% die within 48 hours. The 2 - week mortality rate approaches 75% in patients with undiagnosed ascending aortic dissection.[1]

HPI	Signs and Symptoms	Considerations
• Age • Medications • Viagra®, Levitra®, Cialis® • PMH (MI, Angina, DM, HTN) • Allergies (ASA, Morphine) • Onset • Quality (crushing, sharp, dull, constant, etc.) • Region / Radiation / Referred • Severity (1 - 10) • Time (duration / repetition)	• Weak / absent pulses in lower extremities • Cooler temperatures in lower extremities • Central abdominal mass with possible pulsations • Anterior chest / upper back pain • "*Tearing*" sensation in back or chest • Tachycardia • Hypertension	• Trauma vs. Medical • Angina vs. MI • Pericarditis • Pulmonary embolism • Asthma / COPD • Pneumothorax • GI reflux, hiatal hernia • Esophageal spasm • Chest wall injury or pain • Pleural pain

[1] Emedicine: Emergent Management of Acute Aortic Dissection
Author: John M Wiesenfarth, MD, FACEP, FAAEM; Chief Editor: Barry E Brenner, MD, PhD, FACEP

Protocol
2-5
Continued

AORTIC DISSECTION & AAA

	EMR	EMT	A	I	P
1. Perform general patient management.	•	•	•	•	•
2. Support life-threatening problems associated with airway, breathing, and circulation.	•	•	•	•	•
3. Administer oxygen to maintain ***SPO$_2$*** 94 - 99%	•	•	•	•	•
4. Obtain VS in both arms and assess distal pulses.	•	•	•	•	•
5. Place the patient on a monitor and obtain (BLS)/interpret (ALS) *12 lead ECG*; Refer to appropriate *Cardiac Patient Care Protocol* as needed. *DO NOT administer ASA if acute MI is present in conjunction with suspected AAA or aortic dissection.*		•	•	•	•
6. Establish two IV of normal saline and titrate to a systolic B/P > 90 mmHg. Do not delay transport to establish second IV.			•	•	•
7. Administer *FENTANYL* 1mcg / kg IN / IV / IM or *MORPHINE* 2.5 - 5.0 mg IV / IM as needed, per *Pain Management Patient Care Protocol*.			•	•	•
8. Administer *ONDANSETRON* (Zofran) 0.1 mg / kg slow IVP as needed per *Medical - Nausea and Vomiting* protocol.		•	•	•	•
9. Consider *LEVOPHED* Infusion 0.1-0.5 mcg / kg / minute for hypotension. **Titrate to systolic B/P > 90 mmHg**				•	•
10. Transport and perform ongoing assessment as indicated.		•	•	•	•

PEARLS:

1. Treatment goals are to maintain systolic BP 90 -120 mmHg and heart rate between 50 - 80 bpm.
2. Do not delay transport for any reason if possible, interventions should be done enroute to appropriate facility.
3. Abdominal mass may not be palpable in obese patients.
4. Physical examination may reveal a murmur of aortic insufficiency.
5. Type A dissection occurs in the ascending aorta, while a Type B dissection occurs just distal to the left subclavian artery.

SECTION: Adult Cardiovascular Emergencies

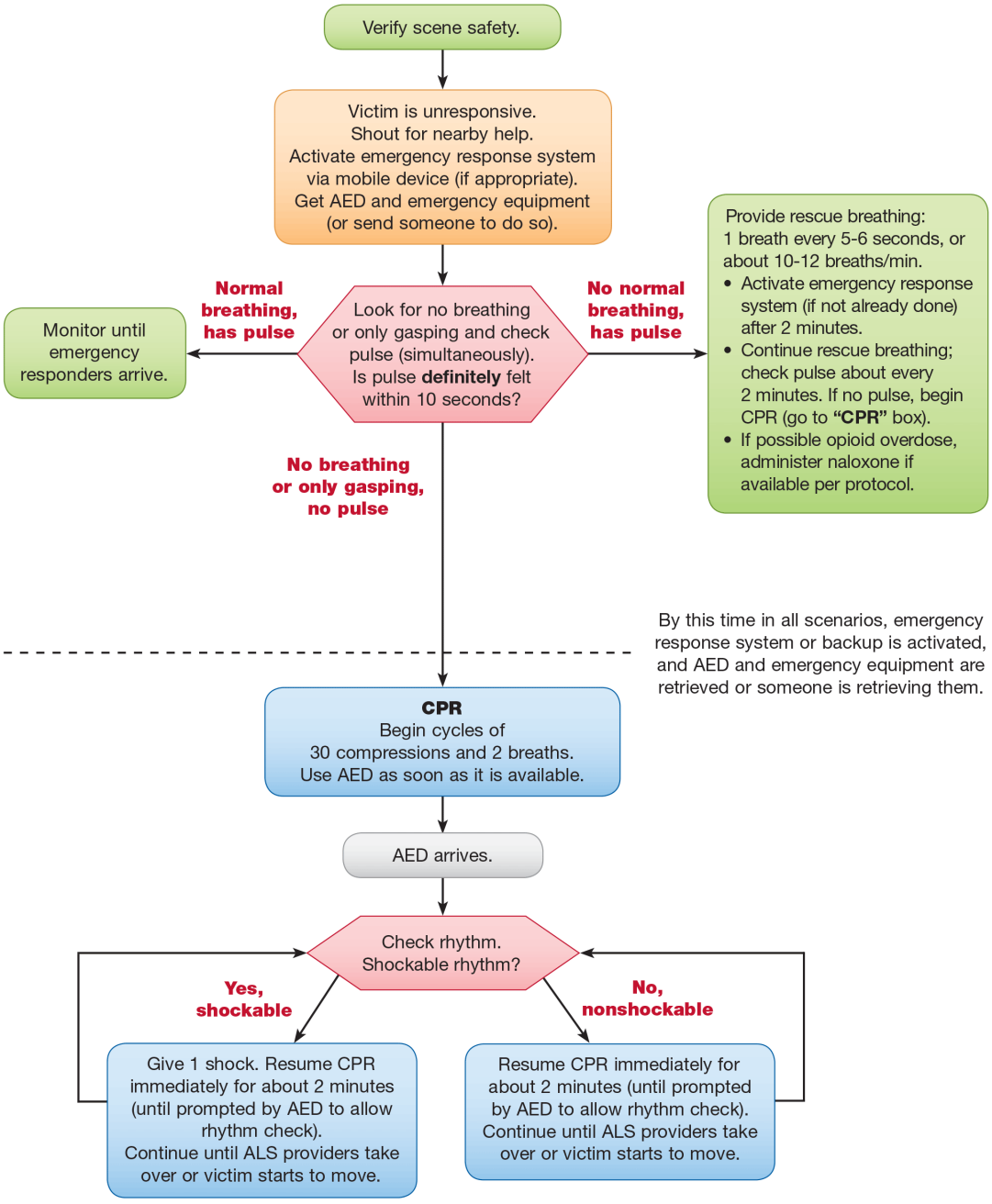
PROTOCOL TITLE: Cardiac Arrest – Unknown Rhythm (i.e. BLS)

REVISED: 01/2018

Protocol
2-6

BLS PULSELESS ARREST

BLS Healthcare Provider
Adult Cardiac Arrest Algorithm—2015 Update



Protocol
2-6
Continued

BLS PULSELESS ARREST

POSSIBLE CAUSES OF PULSELESS ARREST			
A	Alcohol, Abuse, Acidosis	**T**	Toxidromes, Trauma, Temperature, Tumor
E	Endocrine, Electrolytes, Encephalopathy	**I**	Infection, Intussusception
I	Insulin	**P**	Psychogenic, Porphyria, Pharmacological
O	Oxygenation, Overdose, Opiates	**S**	Space occupying lesion, Sepsis, Seizure, Shock
U	Uremia		

PEARLS:

1. If airway is maintainable initially with a BVM, delay rescue airway insertion until after initial defibrillation. The best airway is an effective airway with the least potential complications.
2. Continue CPR while AED is charging.
3. CPR should not be stopped for any reason, if at all avoidable, other than to check for rhythm post-defibrillation. Any stop of compressions should be kept as short as possible, preferably a maximum of 10 seconds.
4. Rescue airway placement should be performed during compressions.
5. Pay close attention to rate of manual ventilation. The rate should be maintained at 8 - 10 breaths per minute. Hyperventilation should be avoided because it decreases preload, cardiac output, coronary perfusion, and cerebral blood flow. The oxygenation goal is to maintain a SPO_2 of 94 - 99% throughout resuscitation.

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: General – Cardiac Arrest

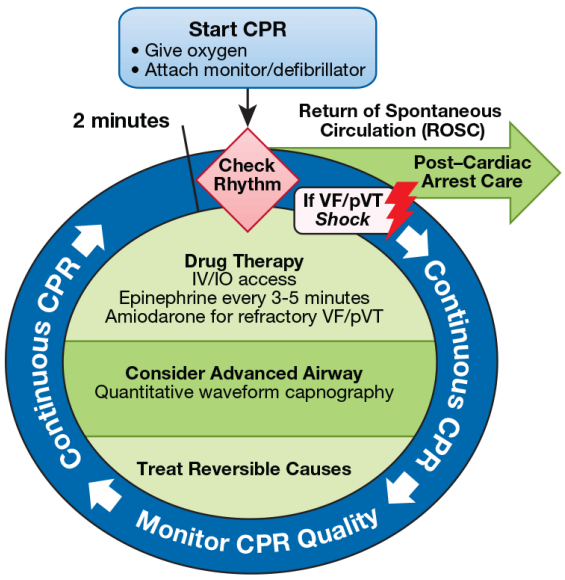
REVISED: 06/2015

Protocol
2-7

ALS PULSELESS ARREST

OVERVIEW:
Cardiac arrest can be caused by Ventricular Fibrillation (VF), pulseless Ventricular Tachycardia (VT), Pulseless Electric Activity (PEA), and asystole. VF represents disorganized electric activity, whereas pulseless VT represents organized electric activity of the ventricular myocardium. Neither of these rhythms generates significant forward blood flow. PEA encompasses a heterogeneous group of organized electric rhythms that are associated with either absence of mechanical ventricular activity or mechanical ventricular activity that is insufficient to generate a clinically detectable pulse. Asystole (perhaps better described as ventricular asystole) represents absence of detectable ventricular electric activity with or without atrial electric activity. The foundation of successful ACLS is high quality CPR, and, for VF / pulseless VT, attempted defibrillation within minutes of collapse. For victims of witnessed VF arrest, early CPR and rapid defibrillation can significantly increase the chance for survival to hospital discharge.

Adult Cardiac Arrest Circular Algorithm—2015 Update



CPR Quality

- Push hard (at least 2 inches [5 cm]) 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 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.

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.

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 P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

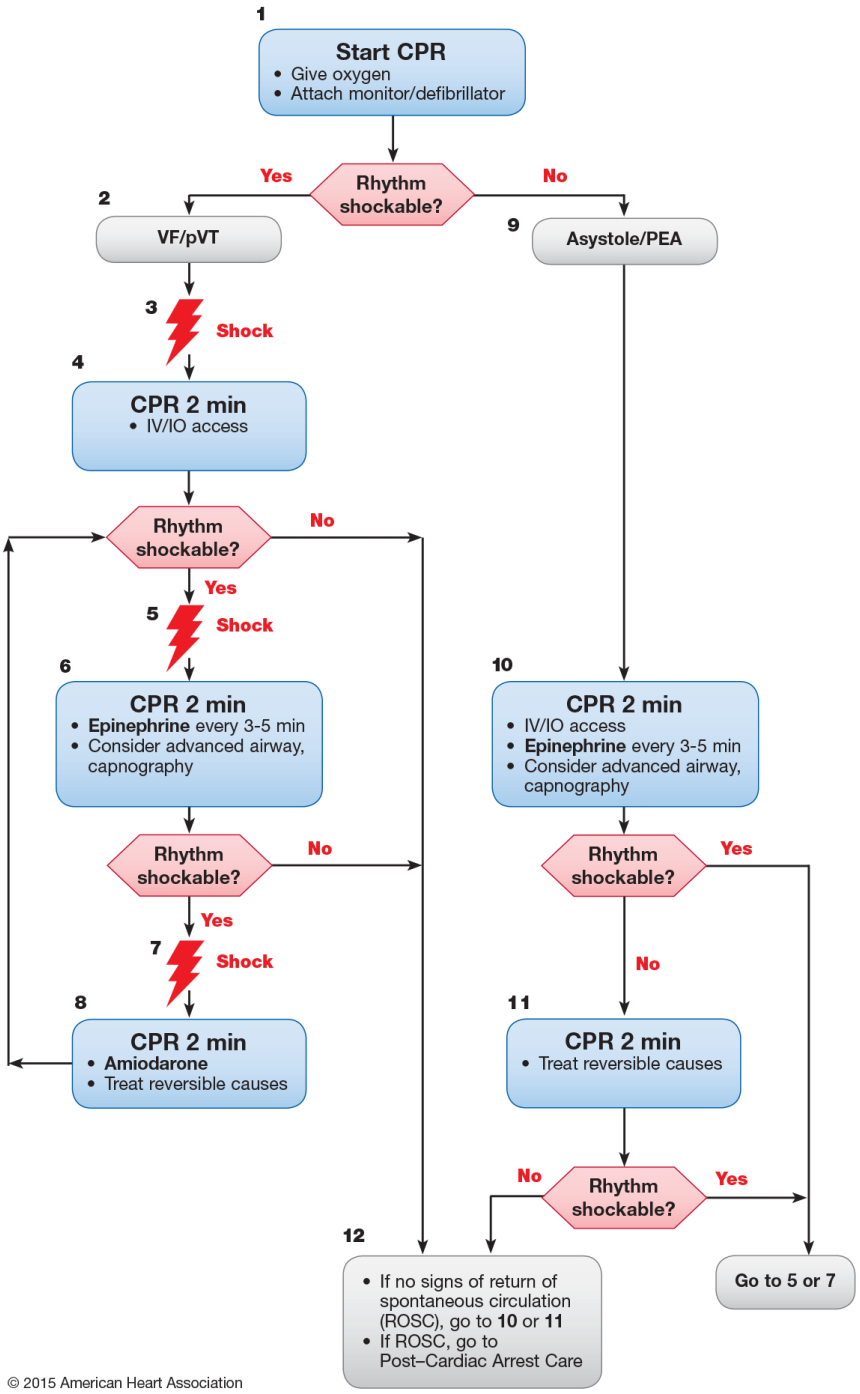
Reversible Causes

- **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

Protocol 2-7 Continued

ALS PULSELESS ARREST

Adult Cardiac Arrest Algorithm—2015 Update



CPR Quality

- Push hard (at least 2 inches [5 cm]) 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 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.

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.

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 P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

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

Protocol
2-8

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – Supraventricular Tachycardia (including atrial fibrillation)
Medical - Tachycardia
Medical - Ventricular Tachycardia with a Pulse

REVISED: 06/2017

TACHYCARDIA WITH A PULSE

OVERVIEW:
Tachycardia's can be classified in several ways, based on the appearance of the QRS complex, heart rate, and regularity. ACLS professionals should be able to recognize and differentiate between sinus tachycardia, narrow-complex Supraventricular Tachycardia (SVT), and wide-complex tachycardia. Because ACLS providers may be unable to distinguish between supraventricular and ventricular rhythms, they should be aware that most wide-complex (broad-complex) tachycardias are *ventricular* in origin.

HPI	Signs and Symptoms	Considerations
		QRS < 0.12 ms

• Past medical history
• Medications: (Aminophylline, Diet Pills, Thyroid Supplements, Decongestants, Digoxin)
• Diet (caffeine, chocolate)
• Drugs (nicotine, cocaine)
• History of palpitations / heart racing
• Syncope / near syncope
	• Heart rate > 150 bpm
	• Dizziness
	• Chest Pain
	• Shortness of Breath
	• Potential presenting rhythm:
	  ○ Sinus tachycardia
	  ○ Atrial Fibrillation / Flutter
	  ○ Multifocal atrial tachycardia (MAT)
		• Sinus tachycardia
		• Atrial fibrillation
		• Atrial flutter
		• AV nodal reentry
		• Accessory pathway – mediated tachycardia
		• Atrial tachycardia (including automatic and reentry forms)
		• Multifocal atrial tachycardia (MAT)
		• Junctional tachycardia (rare in adults)

		QRS > 0.12 ms
		• Ventricular tachycardia (VT) and ventricular fibrillation(VF) • SVT with aberrancy • Pre-excitation tachycardia's (Wolff-Parkinson-White [WPW] syndrome) • Ventricular paced rhythms

Protocol
2-8
Continued

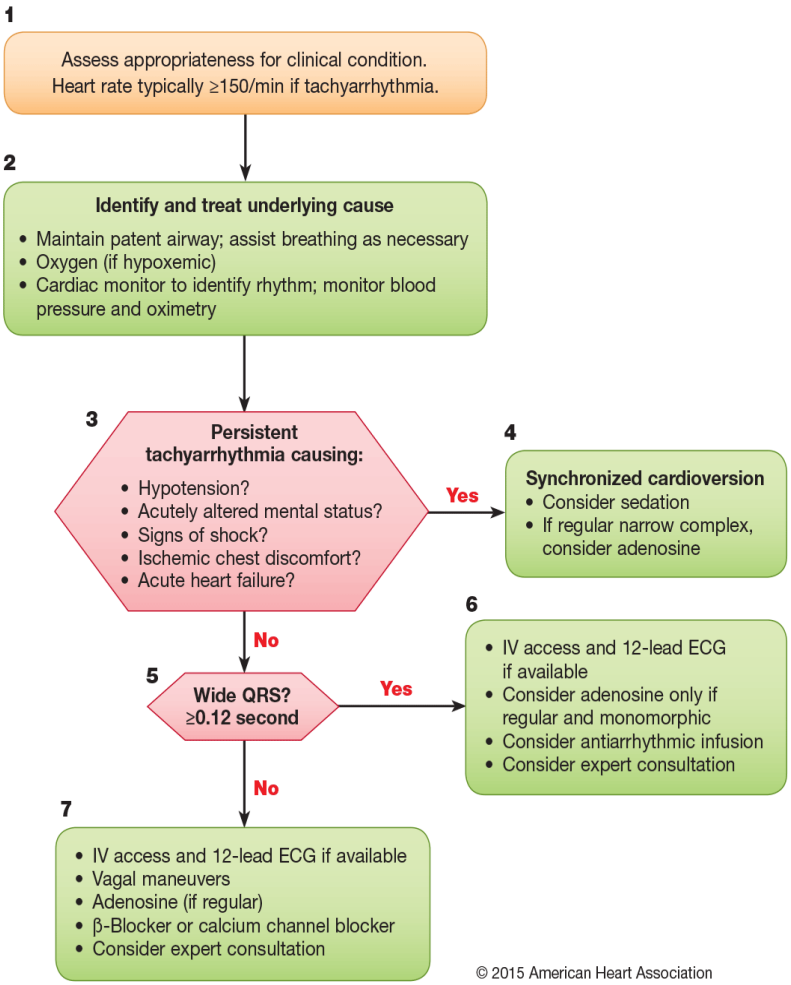
TACHYCARDIA WITH A PULSE

PEARLS:

1. Approved vagal maneuvers include coughing, bearing down as if attempting a bowel movement, and attempting to blow plunger out of 10 mL syringe. ***Carotid sinus massage and / or ocular massage are not approved.***
2. Irregular narrow-complex tachycardias are likely atrial fibrillation or MAT; occasionally atrial flutter is irregular.
3. Each dose of Adenosine should be drawn up completely in a 5 ml syringe. Both the Adenosine and a 10 ml syringe of NS should be inserted, together, in the port closest to the IV catheter. Adenosine should be administered rapid IVP followed immediately by the Normal Saline flush administered rapid IVP. Due to the half-life of Adenosine, this is the only way to assure its efficacy and safety. Slow administration allows for a prolonged effect on the SA and AV node, which may result in prolonged bradycardia or asystole after rhythm converts.
4. Patients with past history of SVT conversion by Adenosine alone are more likely to convert by medication alone. Those who do not convert easily are patients on aminophylline, or similar agents (including high dose caffeine ingestion). A proper history should include number of conversions in past, and whether cardioversion was necessary.

TACHYCARDIA WITH A PULSE

Adult Tachycardia With a Pulse Algorithm



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.

This page intentionally
left blank.

SECTION: Adult Cardiovascular Emergencies

PROTOCOL TITLE: Medical – Bradycardia

REVISED: 06/2017

Protocol 2-9

BRADYCARDIA

OVERVIEW:
Brady-arrhythmias can be caused by two mechanisms: depression of sinus nodal activity or conduction system blocks. In both situations, subsidiary pacemakers take over and pace the heart, provided the pacemaker is located above the bifurcation of the Bundle of His, and the rate is generally adequate to maintain cardiac output. The need for emergent treatment is guided by two considerations: evidence of hypoperfusion and the potential of the rhythm to degenerate into a more profound bradycardia or Asystole.

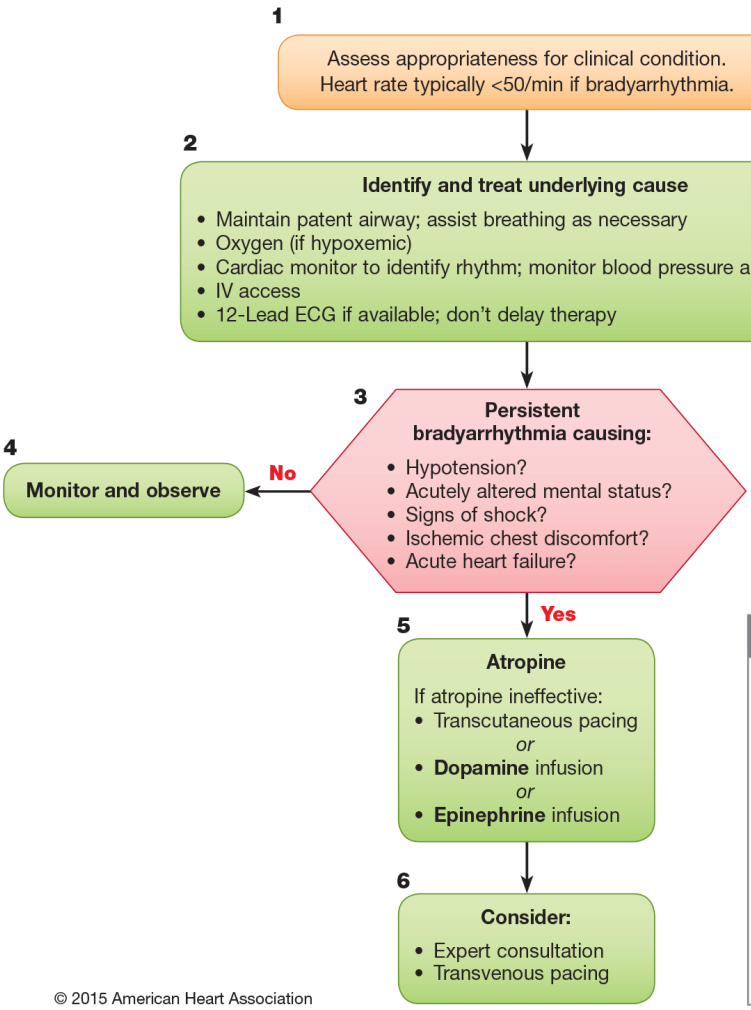
HPI	Signs and Symptoms	Considerations
• Past medical history • Medications (Beta Blockers, Calcium channel blockers, Clonidine, Digitalis) • Pacemaker	• Heart rate < 60 bpm • Chest pain • Respiratory distress • Hypotension or shock • Altered mental status • Syncope	• Acute myocardial infarction • Hypoxia • Hypothermia • Sinus bradycardia • Athletes • Head injury (elevated ICP) or stroke • Spinal cord lesion • Sick sinus syndrome • AV blocks (1st, 2nd, or 3rd degree)

PEARLS:
1. Symptomatic 2nd and 3rd degree heart block should be treated with transcutaneous pacing, avoid Atropine.
2. In the setting of AMI or suspected acute cardiac ischemia, transcutaneous pacing should be first, only if the patient is showing profound symptoms of poor perfusion.
3. Electrical capture during transcutaneous pacing is defined as an electrical stimulus marker followed by a wide QRS complex, with no underlying intrinsic rhythm, followed by a T - wave. This should occur for each electrical complex.
4. Mechanical capture is confirmed when the patient's pulse matches the displayed pace rate. Because pacing stimuli generally causes muscular contractions that can be mistaken for a pulse, you should never take a pulse on the left side of the body to confirm mechanical capture. Pectoral muscle contractions due to pacing also do not indicate mechanical capture. To avoid mistaking muscular response to pacing stimuli for arterial pulsations, use ONLY: (1) right femoral artery or (2) right brachial for confirming mechanical capture.
5. Acute myocardial infarcts can present with hypotension and brady-arrhythmias. Obtain 12-Lead ECG.
6. If hypotension exists with bradycardia, treat the bradycardia.
7. If blood pressure is adequate, monitor only.
8. Treatment of bradycardia is based upon the presence or absence of significant signs and symptoms (symptomatic vs. asymptomatic).

Protocol 2-9 Continued

BRADYCARDIA

Adult Bradycardia With a Pulse Algorithm



Doses/Details

Atropine IV dose:
First dose: 0.5 mg bolus. Repeat every 3-5 minutes. Maximum: 3 mg.

Dopamine IV infusion:
Usual infusion rate is 2-20 mcg/kg per minute. Titrate to patient response; taper slowly.

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