Northwest Texas Healthcare Systems

PANHANDLE EMERGENCY MEDICAL SERVICES SYSTEM (PEMSS)

"A System To Save Lives"

Cardiac Protocols (ACLS)

June 2005

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A. Basic life support (BLS) should be instituted per AHA BLS Standards for these ACLS protocols.

B. The ONLY ACLS procedure that supersedes the CPR of BLS is early defibrillation.
   * Defibrillators used may be monophasic, or the equivalent biphasic type.
   1. Successful completion of ACLS is highly recommended.
   2. The AHA ACLS algorithms have been added as an educational tool, and as treatment guidelines for the paramedic to follow, however, some skills, procedures, and drugs are not included in the PEMSS protocols. Follow the PEMSS protocol and algorithm.

C. First, treat the patient, not the monitor.

D. If an arrhythmia is to be treated, do so in the following order:
   1. Treat rate.
   2. Treat rhythm.
   3. Treat blood pressure.

E. The preferred IV for cardiac arrest is normal saline through a large bore (at least 18 gauge) 1.5 inch catheter placed in an antecubital vein or external jugular vein.

F. Medications should be given IV as soon as an IV is available. Allow 30-60 seconds following administration of each drug to circulate with CPR in progress to ascertain its effect in a patient in cardiac arrest.

G. Pending IV access, standard dose epinephrine, atropine and lidocaine can be given via endotracheal tube at twice the IV dose (High dose epinephrine WILL NOT be utilized in the PEMSS system).

Cardiac resuscitation requires aggressive field interventions that will be expected of each BLS/ALS/MICU provider. Meaningful survival is unlikely without attention to both heart and brain. Previously cardiac arrest victims have been treated with a “one size fits all” approach, preventing providers from directing treatment to optimize resuscitation. The following guidelines shall be considered in all cases of arrest:

1. BLS interventions with uninterrupted chest compressions, compressing the chest deeply enough and quick enough to generate coronary perfusion pressure.
2. Continuous ECG monitoring, rhythms can be categorized as organized or not organized. Organized rhythms i.e.- (sinus, atrial fib, SVT, V-tach) Disorganized- V-fib and asystole. Organized rhythms usually pump blood, unless they are too slow. Disorganized do not pump blood. Therefore if the rhythm is not organized – perform an intervention to make it organized, and if an organized rhythm is too fast or too slow, perform an intervention to correct the rate.
3. Biphasic shocks appear to be more successful than monophasic shocks.
4. Prime the cardiac pump – if a cardiac arrest victim has been in arrest greater than three to four minutes, the initial rhythm is usually fine v-fib. Studies have shown that 2-3 minutes of CPR prior to the delivery of the initial shock improved defibrillation success rates.
5. Drug therapy – in cardiac arrest can be divided into three categories: vasopressor, antidysrhythmic, and metabolic drugs. There is good evidence that vasopressors improve coronary perfusion pressure developed by chest compressions, making resuscitation more likely. Vasopressin and epinephrine will be used, but vasopressin shows superior
effects for patients who present in asystole or PEA. Amiodarone is shown to be superior to lidocaine for restoration of pulses in v-fib not terminated by shocks.

6. Brain therapy – the brain is very sensitive to low blood pressure after cardiac arrest, providers should anticipate the initial high blood pressure observed moments after restoration of pulses, and quickly prepare to use dopamine to maintain blood pressure the instant the pressure starts to fall, and to maintain brain perfusion.

H. These protocols utilize standard dose epinephrine in all adult victims of cardiac arrest.

I. If the patient cannot be intubated, utilize BVM ventilation, and if not contraindicated, insert a combitube airway or the Cobra PLA. (Cobra PLA preferred)

J. Notes:
   1. **Standard dose epinephrine is the standard bristojet of 1 mg in 10cc solution (1:10,000).**

   2. Serious signs and symptoms, particularly for the bradycardia and tachycardia protocols, include the following:
      a. **signs** = hypotension, congestive heart failure, decreased level of consciousness, and PVCs in the setting of acute MI.
      b. **symptoms** = chest pain and shortness of breath.

K. The ACLS/PALS guidelines allow certain invasive procedures to be performed. The following procedures are permitted to be utilized if appropriate under the PEMSS protocols:

   1. Needle Pleural Decompression
   2. Surgical Cricothyrotomy - Adult
   3. Needle Cricothyrotomy - Child
   4. Umbilical Vein Catheterization
   5. Intraosseous Infusion - Adult or pediatric

The following invasive procedures are NOT permitted under the PEMSS Protocols:

   1. Pericardiocentesis
   2. Central lines (i.e. subclavian or internal jugular)
   3. Chest tube placement
Universal Algorithm for Adult Emergency Cardiac Care

Assess responsiveness

Responsive
- Observe
- Treat as Indicated

Not Responsive
- Activate EMS
- Call for defibrillator
- Assess breathing (open the airway, look, listen, and feel)

Breathing
- Place in recovery position if no trauma

Not Breathing
- Give 2 slow breaths
- Assess circulation

No Pulse

Start CPR

Ventricular fibrillation/Tachycardia (VF/VT) present on monitor/defibrillator?

No

Yes

Suspected Cause

Hypotension / Shock / Acute pulmonary edema
Go to Protocol

Acute MI
Go to Chest Pain Protocol

Arrhythmia

Too slow -
Go to Bradycardia protocol

Too fast -
Go to Tachycardia protocol

Electrical activity?

Yes

No

VF/VT
Go to Protocol

Intubate
- Confirm tube placement; consider end-tidal CO₂ indicator
- Confirm ventilations
- Determine rhythm and cause

Pulseless electrical activity (PEA)
Go to PEA protocol

Asystole
Go to Asystole protocol

Endotracheal intubation
- History
- Physical examination
- Monitor, 12-lead ECG

Rescue Breathing
- Oxygen
- IV
- Vital signs

C5
Acute Pulmonary Edema/Hypotension/Shock

Clinical signs of hypoperfusion, congestive heart failure, acute pulmonary edema
- Assess ABCs
- Secure airway, Oxygen
- Perform physical examination
- IV Therapy
- Assess vital signs
- Review history, Administer oxygen
- 12-lead ECG, Attach monitor, pulse ox and automatic blood pressure

What is the nature of the problem?

Acute Pulmonary Edema

1st - Pulmonary Edema
- Lasix 40-80mg IV or Bumex 1mg IV
- Morphine 2-4mg IV
- NTG SL and Topical
- Continued Oxygen, Intubation as needed

What is the blood pressure (BP)²?

- Systolic BP < 70 mm Hg²
  - Signs and symptoms of shock
  - Consider
  - Epinephrine 2-10 mcg/min IV or
  - Dopamine 5-20 mcg/kg per min

- Systolic BP 70-100 mm Hg²
  - Signs and symptoms of shock
  - Dopamine ²
  - 2.5-20 mcg/kg per min IV

- Systolic BP > 100 mm Hg
  - No signs and symptoms of shock

Further Actions
- Drug Assisted Intubation Protocol
- Further Actions
- ECG-obtain 12 lead ECG
- Oxygen Saturation
- End-Tidal CO2

Volume Problem Administer Fluids (b)

Rate problem

Too slow Go to protocol
Too fast Go to protocol

2nd - Acute Pulmonary Edema
- NTG if BP > 100mm Hg
- Dopamine if BP 70-100 with signs and symptoms of shock
- Oxygen/Intubate PRN

Consider further actions, especially if the patient is in acute pulmonary edema

a. Base management after this point on invasive hemodynamic monitoring if possible. Guidelines presume clinical signs of hypoperfusion.
b. Fluid bolus of 250-500 mL normal saline should be tried. If no response, consider sympathomimetics.
c. Move to dopamine and stop epinephrine when BP improves.
d. Add dopamine if systolic BP drops below 90 mm Hg.
e. Start with nitroglycerine if initial blood pressures are in this range.
Congestive Heart Failure-Pulmonary Edema

Congestive heart failure (CHF) is a symptom, not a diagnosis. The underlying cause of CHF is usually organic heart disease or hypertension, but also may be volume related (renal failure) or toxin related. As with most medical emergencies, in the conscious and awake patient with CHF, reassurance will greatly aid treatment. As the patient becomes more agitated respiratory distress is worsened. The goals of care should include high flow oxygen, ventilatory assistance with positive pressure ventilation, and cardiac monitoring.

1. High concentration oxygen as indicated by the patient's condition.
2. Lasix 40mg-80mg slow IVP (1mg/kg) a potent diuretic, or Bumex 1mg IVP.
3. Morphine can be given in small doses, and will greatly aid in reducing anxiety, also works as a vasodilator and decreases the workload and oxygen requirement of the heart. In the pre-hospital setting, 1 dose of 2mg is usually sufficient in achieving the desired effect. Medical control shall be contacted for any repeat doses. Morphine is drawn up in a 10cc syringe, which is 1cc. Draw up 9cc of NS into the same syringe. This gives you a concentration of 1mg per 1cc. The effects of Morphine can be reversed with Narcan.
4. Consider giving albuterol 2.5mg by HHN for significant bronchospasm (wheezing). If the heart rate is above 150, avoid giving albuterol.
5. Patients that present with CHF should have a 12 lead EKG performed (if available).
6. All patients (male or female) who would receive NTG, must be questioned about taking Viagra (sildenafil citrate), Cialis, or Levitra. Any patient that has taken any of these in the last 24-36 hours should not receive any form of nitrates, irreversible hypotension may occur.
7. Continue monitoring the patients' level of consciousness, Oxygen saturation, and EtCO2 for changes that indicate respiratory failure. Early intubation in patients that present in fulminating pulmonary edema or respiratory failure, proves to be life-saving by greatly decreasing the work of trying to breath, and providing positive pressure ventilations.
Acute Pulmonary Edema/Heart Failure

Assess Level of Consciousness

- **Basic**
  - Assess ABCs (follow NREMT standards as appropriate)
  - Oxygen; pulse oximetry (if available)
  - Transport in sitting or semi-sitting position; if possible
  - Rapid transport; consider mutual aid/air evacuation
  - Contact Medical Control

- **Intermediate**
  - Basic +
  - If BLS ineffective; Intubate follow NREMT standards
  - IV NS @ KVO
  - Contact Medical Control

- **Paramedic**
  - Basic + Intermediate+
  - Monitor ECG
  - Obtain 12 lead (if available) transmit
  - 1. Lasix 40mg IVP or Bumex 1mg IVP, Albuterol 2.5mg HHN (for Wheezing)
     If patient in acute distress: Morphine Sulfate 2mg IV (slow)
  - Contact Medical Control

Acute Distress: Severe Pulmonary Edema or Fulminating Pulmonary Edema
Contact Medical Control to Repeat Morphine
Asystole Treatment Algorithm

- Continue CPR
- Intubate at once
- Obtain IV access
- Confirm asystole in more than one lead

Consider possible causes:
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hyperkalemia/Hypokalemia
- Hypothermia

Consider immediate transcutaneous pacing (TCP)*

- Tablets (drug overdoses)
- Tamponade (cardiac)
- Tension pneumothorax
- Thrombosis-Heart (AMI)
- Thrombosis-Lungs (embolus)

Epinephrine 1 mg IV push, repeat every 3-5 min
Vasopressin 40U IV X1

Atropine 1 mg IV, repeat every 3-5 min up to a total of 0.03-0.04 mg/kg

Class I: definitely helpful
Class IIa: acceptable, probably helpful
Class IIb: acceptable, possibly helpful
Class III: not indicated, may be harmful

- TCP is a Class IIb intervention. Lack of success may be due to delays in pacing. To be effective TCP must be performed early, simultaneously with drugs. Evidence does not support routine use of TCP for asystole.
- The recommended dose of epinephrine is 1 mg IV push every 3-5 min.
- Sodium bicarbonate 1 mEq/kg is Class I if patient has known preexisting hyperkalemia.
- The shorter atropine dosing interval (3 min) is Class IIb in asystolic arrest.
- Sodium bicarbonate 1 mEq/kg:
  - Class IIa
    - If known preexisting bicarbonate-responsive acidosis
    - If overdose with tricyclic antidepressants
    - To alkalinize the urine in drug overdoses
  - Class IIb
    - If intubated and continued long arrest interval
    - Upon return of spontaneous circulation after long arrest interval
  - Class III
    - Hypoxic lactic acidosis
- If patient remains in asystole or other agonal rhythm after successful intubation and initial medications and no reversible causes are identified, consider termination of resuscitative efforts by a physician. Consider interval since arrest.
Termination of Efforts

Asystole is a cardiac arrest rhythm associated with no discernable electrical activity on the ECG. Asystole is rarely associated with a positive outcome. Asystole occurs almost exclusively in severely ill persons. Often this rhythm represents the terminal rhythm of patients whose organs have failed and whose condition has deteriorated. Cardiac function has diminished until cardiac electrical and functional activity finally stops. The purpose of this protocol is for Paramedics to think about the clinical situation prior to terminating resuscitation in the field. Cardiac arrest in special circumstances such as hypothermia, electrocution, and drug overdose will not be a candidate for this protocol.

The following steps will be taken to terminate resuscitation efforts in the field;

A. The patient must not be on the ambulance cot or in the patient care compartment of the ambulance.
B. The paramedic in charge shall confirm in three (3) leads that asystole persist beyond 15 minutes of resuscitation attempts in the field, and all possible identifiable causes have been treated according to ACLS protocol.
C. Ideally, all family members should be in agreement to terminate efforts in the field, however, the spouse, or next-of-kin, have the final legal right to make all decisions concerning their loved ones. The paramedics on scene should act as the “patients advocate” and doing what is best for the patient and family, including the family wishes. Put yourself in their place.
D. Contact Medical Control via telephone for termination orders.
E. All IV line, tubes are to be left in place, and law enforcement is to be contacted.
F. See Life Gift Protocol.
G. A PEMSS report is to be completed and a copy forwarded to the Medical Director.
ASYSTOLE

Confirm Pulseless/Apnea

BLS

Monitor; confirm Asystole in more than one lead
Immediate Transcutaneous pacing

Rapid Transport (consider)

Intubate/IV NS

Treat probable causes /
Initiate drug therapy
any atypical clinical features present

Contact Medical Control

1. Termination of Efforts
Follow PEMSS Protocol

Perform a rapid scene survey:
Any evidence that resuscitation should not be attempted.

Epinephrine 1:10,000 IV push repeat every 3-5 minutes
Vasopressin 40U IV X 1
Atropine 1mg IV push repeat every 3-5 minutes, up to a total of 0.04mg/kg
Bradycardia Algorithm
(Patient is not in cardiac arrest)

- Assess ABCs
- Secure airway
- Ensure monitor/defibrillator available
- Vital signs, pulse oximetry

Assess vital signs
Review history
Perform physical examination
Perform 12-lead ECG (if available)

Consider all causes and proceed with treatment

Too slow (<60 BPM)

Bradycardia, either absolute (<60 BPM) or relatively slow

Serious signs or symptoms?\(^a,b\)
Due to the bradycardia?

- No
- Yes

Type II second-degree AV heart block? or Third-degree AV heart block?\(^c\)

- No
- Yes

Intervention sequence
- **Atropine** 0.5-1.0 mg\(^d\) (I and IIa)
- **TCP**, if available (I)
- **Dopamine** 5-20 mcg/kg per min (IIb)
- **Epinephrine** 2-10 mcg/min (IIb)

- Observe
- Transcutaneous Pacing if unstable
- Use TCP as a bridge device\(^d\)

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**a.** Serious signs or symptoms must be related to the slow rate. Clinical manifestations include
- Symptoms (chest pain, shortness of breath, decreased level of consciousness)
- Signs (low BP, shock, pulmonary congestion, CHF, acute MI)

**b.** Do not delay TCP while awaiting IV access or for **atropine** to take effect if patient is symptomatic.

**c.** Denervated transplanted hearts will not respond to **atropine**. Go at once to pacing, catecholamine infusion, or both.

**d.** **Atropine** should be given in repeat doses every 3-5 min up to total of 0.03-0.04 mg/kg. Use the shorter dosing interval (3 min) in severe clinical conditions. It has been suggested that **atropine** should be used with caution in atrioventricular (AV) block at the His-Purkinje level (Type II AV block and new third-degree block with wide QRS complexes) (Class IIb).

**e.** Never treat third-degree heart block plus ventricular escape beats with **lidocaine**.

**f.** **Isoproterenol** should be used, if at all, with extreme caution. At low doses it is Class IIb (possibly helpful); at higher doses it is Class III (harmful).

**g.** Verify patient tolerance and mechanical capture. Use analgesia and sedation as needed.
BRADYCARDIA

Assess level of consciousness

Oxygen; pulse oximetry (if available)

Consider air evacuation

Transport

Monitor; 12 Lead ECG (If Available)

IV NS @ appropriate rate

TRANSCUTANEOUS PACING (If Indicated)
Sedation for TCP: Versed 2mg IV (If Indicated)
if patient continues to have serious signs and symptoms after Treatment:
Dopamine IV Infusion

Contact Medical Control

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- Slow absolute bradycardia Rate < 60

Serious signs and Symptoms Due to the bradycardia?

NO

YES

Type II (second-Degree)

ATROPINE 0.5-1.0 mg

OR complete A-V (third degree)

Transcutaneous Pacing (IF INDICATED)

Dopamine 5-20ug/kg/min (IF INDICATED)

Epinephrine Infusion 2-10ug/kg/min (refractory to dopamine)

NO

Prepare for TCP if symptoms development

Observe

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Bradycardia
ACLS
Hypertension is not a single disease, but an end result of multiple disease processes. There are multiple underlying causes of Hypertension, though the primary factor is an increase in peripheral vascular resistance. It is important to recognize that an isolated hypertensive reading does not reflect the overall blood pressure status of the patient. Indeed, almost 30% of initial hypertensive readings found in a healthcare environment will resolve with rest (“White coat Hypertension”). In Emergency care, many patients present with a hypertensive blood pressure reading related to the precipitating cause for activating EMS. *While reduction in blood pressure to a “normal” range is important for all patients, acute lowering of the blood pressure may actually cause further harm to the patient by under-perfusion of end-organs (i.e., brain, kidneys).*

**Key points/considerations**

- Any history of Hypertension or CVA? Any headache, dizziness, syncopal episodes, numbness or tingling in any part of the body?

- Is there weakness or paralysis on one side of the body? Is there any facial drooping? Aphasia or decreased LOC?

- Most hypertensive patients in the prehospital setting should be monitored, stabilized and provided with supportive care and blood pressure reassessment.
Hypertension

Assess Level of Consciousness
Use GCS and Cincinnati Prehospital Stroke Scale

BLS
place in fowler's position

Oxygen;
pulse oximetry (if available)

Transport

IV NS @ appropriate rate or saline lock

Monitor ECG: Obtain 12 Lead ECG
(if available)

Determine probable nature of
condition if possible

Frequent evaluation of vital signs,
GCS, Stroke scale, Glucose

Contact
Medical Control

Cincinnati Prehospital
Stroke Scale
3 Components
Facial Droop-ask patient to
show teeth and smile
Arm Drift-ask patient to
extend arms,palms down,
with eyes closed
Speech-ask patient to say
"you can't teach an old
dog new tricks"
LOOK FOR ABNORMALITIES
Pulseless Electrical Activity (PEA) Algorithm
( Electromechanical Dissociation [EMD])

Includes
- Electromechanical dissociation (EMD)
- Pseudo-EMD
- Idioventricular rhythms
- Ventricular escape rhythms
- Bradysystolic rhythms
- Postdefibrillation idioventricular rhythms

Consider possible causes
(Parentheses = possible therapies and treatments)
- Hypovolemia (volume infusion)
- Hypoxia (ventilation)
- Cardiac tamponade (pericardiocentesis)
- Tension pneumothorax (needle decompression)
- Hypothermia (see Hypothermia Protocol, page 87)
- Massive pulmonary embolism (surgery, thrombolytics)
- Drug overdoses such as tricyclics, digitalis, B-blockers, calcium channel blockers
- Hyperkalemia
- Acidosis
- Massive acute myocardial infarction
- Go to Chest Pain Protocol

Class I:
definitely helpful
Class IIa:
acceptable, probably helpful
Class IIb:
acceptable, possibly helpful
Class III:
not indicated, may be harmful

* Sodium bicarbonate 1 mEq/kg is Class I if patient has known preexisting hyperkalemia.
* Sodium bicarbonate 1 mEq/kg
  Class Ia
  1. If known preexisting bicarbonate-responsive acidosis
  2. If overdose with tricyclic antidepressants
  3. To alkalize the urine in drug overdoses

  Class Ib
  1. If intubated and continued long arrest interval
  2. Upon return of spontaneous circulation after long arrest interval

  Class III
  1. Hypoxic lactic acidosis
  2. The recommended dose of epinephrine is 1 mg IV push every 3-5 min.
  3. The shorter atropine dosing interval (3 min) is possibly helpful in cardiac arrest (Class IIb).

Epinephrine 1 mg IV push, repeat every 3-5 min
Vasopressin 40U IV X 1

If absolute bradycardia (< 60 BPM) or relative bradycardia, give atropine 1 mg IV
Repeat every 3-5 min to a total of 0.03-0.04 mg/kg

PEMSS Protocols
June 2005
Pulseless Electrical Activity (PEA) Advanced Cardiac Life Support (ACLS)
PULSELESS ELECTRICAL ACTIVITY (PEA)

Confirm Pulseless/Apnea

BLS

Monitor; confirm PEA

Rapid Transport

Intubate / IV NS

Treat probable causes:
If unsuccessful, initiate drug therapy

Epinephrine 1mg IV every 3-5 minutes
Vasopressin 40U IV X1
If rate is slow < 60
Atropine 1mg IV repeat every 3-5 minutes

Contact Medical Control
Tachycardia Algorithm

**Assessment**
- **Patient Clinically Unstable?**
- **Cardiac Function Impaired?**
- **Is WPW Present?**
- **Duration < or > 48 hours?**

**Evaluation Focus**
- Narrow Complex Tachycardias
- Wide-complex tachycardia of uncertain type - Stable
- Ventricular tachycardia (VT) stable monomorphic or polymorphic

**Complex Width?**
- Narrow
- Wide

**Blood Pressure?**
- Normal or elevated
- Lower or unstable

**Treat Unstable Patients Urgently Control the Rate**

**If Ventricle Rate > 150 BPM**
- Prepare for immediate cardioversion
- May give brief trial of medications based on arrhythmia
- Immediate cardioversion is seldom needed for heart rates <150 BPM

**Tachycardia Algorithm Figure 6**

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**Treatment Focus**
- Atrial fibrillation
- Atrial flutter
- Narrow complex tachycardias
- Wide-complex tachycardia of uncertain type - Stable

**Unstable with serious signs or symptoms**
- Yes

**No or borderline**

**Atrial fibrillation**

**Atrial flutter**

**Evaluation Focus 4 features**
- Is patient clinically unstable?
- Cardiac function impaired?
- Is WPW present?
- Duration < or > 48 hours?

**Complex Width?**
- Narrow
- Wide

**Blood Pressure?**
- Normal or elevated
- Lower or unstable

**Treatment Options**
- **Cardizem** 15-20mg IV
- **Cardizem** 25mg IV over 2 mins
- **Cordarone** 150mg IV
- **Lidocaine** 0.5mg/kg IV
- **Procainamide** 20-30mg/min IV
- **Polymorphic, prolonged QT**
  - Cordarone, lidocaine, procainamide

**Synchronized cardioversion**

---

**a.** Unstable condition must be related to the tachycardia. Signs and symptoms may include chest pain, shortness of breath, decreased level of consciousness, low blood pressure (BP), shock, pulmonary congestion, congestive heart failure, acute myocardial infarction.

**b.** Carotid sinus pressure is contraindicated in patients with carotid bruits; avoid ice water immersion in patients with ischemic heart disease.

**c.** If the wide-complex tachycardia is known with certainty to be PSVT and BP is normal/low, sequence may include **Cardizem**.

**d.** Use extreme caution with B-blockers after **Cardizem**.
A. SUPPLEMENTAL NOTES:

1. Cardizem will be used to control the ventricular rate in atrial fibrillation and atrial flutter, and in patients that have received adenosine in PSVT with a narrow QRS complex and adequate blood pressure. Not for use in wide QRS tachycardias or for poison/drug induced tachycardias. Avoid using Cardizem in patients with Wolff-Parkinson-White syndrome (WPW), atrial fib or flutter with sick sinus syndrome, or in AV blocks without a pacemaker (greater than a first degree). Expect a fall in blood pressure resulting from vasodilation. Avoid Cardizem in patients who are taking oral beta blockers.

2. Calcium chloride can be used prophylactically, or as therapy for adverse reactions to Cardizem. CaCl$_2$ 4 mg/kg Slow IV prior to Calcium Channel Blocker. (Cardizem)

3. Availability of external transcutaneous pacemaker is strongly advised.

4. Other vagal maneuvers by medical control request:
   a. Facial immersion in ice water is controversial and is contraindicated if heart disease is present. In adult patients, immersion time must be at least 30 seconds.
   b. Carotid sinus massage is controversial. It is contraindicated in patients > 50 years of age, bruits on exam, or if history of stroke, TIA, neck surgery, or any type of aneurysm.

5. Adenosine should be given rapid IVP (1 to 3 sec.) followed by saline flush.

6. A contraindication to adenosine is Persantine (dipyridamole) which may sustain adenosine’s action for several minutes.

1. Atrial Fibrillation is the chaotic firing of multiple electrical foci in the atria. It can only be confirmed by EKG monitoring and a 12 lead EKG, but can be suspected by an irregularly irregular pulse. Atrial fibrillation can be associated with other cardiac abnormalities like hypertension, hypoxia, increased atrial pressure secondary to a pulmonary embolus, pericarditis, hyperthyroid and goiter. In some cases, it is difficult to distinguish Afib from SVT. Adenosine may be used in some cases to slow the rate enough to confirm that the actual rhythm is Afib with RVR, at that point you would use Cardizem.

2. Atrial Flutter refers to a supraventricular rhythm with atrial flutter waves. The ventricular rate is limited by A-V nodal conduction, typically with a 2:1 or 3:1 block. Flutter waves are best seen in leads II, III, AvF, on the 12 lead ECG. Atrial flutter seldom occurs in the absence of underlying organic heart disease. Treatment of atrial flutter and atrial fibrillation in the prehospital setting is focused on maintaining adequate perfusion, oxygenation, and determination of any potential underlying etiology. Atrial flutter usually converts to a lower energy level if cardioversion is indicated.
TACHYCARDIA-Atrial fibrillation and Flutter
Supraventricular Tachycardia (SVT)
Ventricular Tachycardia

Asses Level of Consciousness

BLS

Oxygen;
pulse oximetry (if available)

Transport

Consider air evacuation

IV NS @ appropriate rate

Monitor ECG
(12 lead ECG if available).

Consider premedication for EC
Morphine 2-5mg IV
or Versed 2-4mg IV

Supraventricular Tach. (SVT)
Adenosine 6mg IVP
if no change in 1-2 mins
Adenosine 12mg IVP
if no change in 1-2 mins
Adenosine 12mg IVP
or if no change in rhythm
proceed with Cardizem 15-20mg IV over 2 mins
(0.25mg/kg)

Contact
Medical Control

Atrial fib/flutter
Cardizem 15-20mg IV
over 2 minutes
(0.25mg/kg)
May repeat in 15 minutes
Cardizem 20-25mg IV
over 2 minutes
(0.35mg/kg)
For Wolfe-Parkinson-White (WPW) Syndrome
Cordarone 150mg IV
or Procainamide 20mg/min IV infusion until:
Arrhythmia suppression
Hypotension
QRS widens by 50%
OR
Total dose 17mg/kg given

VENTRICULAR TACHYCARDIA
Cordarone 150mg IV
over 10 minutes
or
Lidocaine 0.5mg/kg IVP
Patient with serious signs and symptoms:
Proceed with synchronized cardioversion.
(premedicate if indicated)
Torsades
Mag sulfate 1-2 grams slow IVP

Patients with serious signs and symptoms: Electrical Cardioversion

PEMSS Protocols
June 2005
Electrical Cardioversion Algorithm
(Patient is not in cardiac arrest)

Tachycardia
With serious signs and symptoms related to the tachycardia

If ventricular rate is >150 BPM, prepare for immediate cardioversion. May give brief trial of medications based on specific arrhythmias. Immediate cardioversion is generally not needed for rates <150 BPM.

Check
- Oxygen saturation
- Suction device
- IV line
- Intubation equipment

Premedicate whenever possible

Synchronized cardioversion
- VT
  - 100 J, 200 J
  - PSVT
  - 100 J, 200 J, 300 J, 360 J
  - Atrial fibrillation
  - 300 J, 360 J
  - Atrial flutter

a. Effective regimens have included a sedative (eg midazolam, with or without an analgesic agent (eg. morphine).

b. Note possible need to resynchronize after each cardioversion.

c. If delays in synchronization occur and clinical conditions are critical, go to immediate unsynchronized shocks.

d. Treat polymorphic VT (irregular form and rate) like VF: 200 J, 200-300 J, 360 J.

e. PSVT and atrial flutter often respond to lower energy levels (start with 50 J).
Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/VT) Algorithm

- ABCs
- Perform CPR until defibrillator attached
- VF/VT present on defibrillator

Defibrillate up to 3 times if needed for persistent VF/VT (200 J, 250-300 J, 360 J)

Rhythm after the first 3 shocks?

Persistent or recurrent VF/VT
- Continue CPR
- Intubate at once
- Obtain IV access

Epinephrine 1 mg IV push, repeat every 3-5 min
Vasopressin 40U IV one time

Defibrillate 360 J within 30-60 s

Antiarrhythmics:
- Cordarone 300mg IV push or
- Lidocaine 1.0-1.5mg/kg IV q3-5 min
- Procainamide 30mg/min max 17mg/kg IVP
- Mag Sulfate 1-2gms IV (Torsades or Hypomagnesemic)

Defibrillate 360 J, 30-60 s after each dose of medication
- Pattern should be drug-shock, drug-shock

Rhythm after the first 3 shocks?

Return of spontaneous circulation
- Assess vital signs
- Support airway
- Support breathing
- Provide medications appropriate for blood pressure, heart rate, and rhythm

Class I: definitely helpful
Class IIa: acceptable, probably helpful
Class IIb: acceptable, possibly helpful
Class III: not indicated, may be harmful

a. Precordial thump is a Class IIb action in witnessed arrest, no pulse, and no defibrillator immediately available.
b. Hypothermic cardiac arrest is treated differently after this point. See hypothermia algorithm.
c. The recommended dose of epinephrine is 1 mg IV push every 3-5 min. If this approach fails, several Class IIb dosing regimens can be considered:
   - High Dose Epinephrine has been eliminated.
d. Vasopressin is recommended only for VF/VT. If no response in 5-10 minutes it is acceptable to resume epinephrine 1mg IV every 3-5 minutes.
e. Sodium bicarbonate 1 mEq/kg is Class II if patient has known preexisting hyperkalemia.
f. Multiple sequenced shocks are acceptable here (Class I), especially when medications are delayed.
g. Medication sequence:
   - Cordarone 300mg IVP in cardiac arrest VF/pulseless VT or
   - Lidocaine 1.0-1.5mg/kg IVP in 3-5 minutes consider max 3mg/kg IVP
     A single dose of 1.5mg/kg in cardiac arrest is acceptable.
   - Magnesium sulfate 1-2 g IV in torsades de pointes or suspected hypomagnesemic state or refractory VF.
   - Procainamide 30 mg/min in refractory VF (maximum total 17 mg/kg).
g. Sodium bicarbonate 1 mEq/kg IV in several conditions known to provoke cardiac arrest.
   - Class IIa
     - If known preexisting bicarbonate-responsive acidosis
     - If overdose with tricyclic antidepressants
     - To alkalize the urine in drug overdoses
   - Class IIb
     - If intubated and continued long arrest interval
     - Upon return of spontaneous circulation after long arrest interval
   - Class III
     - Hypoxic lactic acidosis
VF/VT (PULSELESS)

Confirm Pulseless/Apnea

Confirm VF/VT

Defibrillate

Rapid Transport

Intubate / IV

Epinephrine 1mg IV Pq 3-5 mins or Vasopressin 40 units IV

Defibrillate (monophasic or biphasic defibrillator)

If known or suspected tricyclic ingestion:
Sodium Bicarbonate 1 mEq/kg IV push immediately after intubation

Cordarone 300mg IV
Drip:
150mg in 100cc D5W infuse over 15 minutes.

Or
Lidocaine 1.0-1.5mg/kg IVP premix drip:
1-4mg/min

Procainamide (for recurrent VF/VT)
50mg/min IV maximum 17mg/kg

Magnesium Sulfate
1-2gms over 1-2mins

Cordarone 300mg IVP or Lidocaine 1.0-1.5mg/kg IVP

Defibrillate 30-60 seconds after each dose of medication
Pattern should be drug-shock, drug-shock, etc.

CONTACT
MEDICAL CONTROL

1. If rhythm changes: reassess Pt. follow appropriate PEMSS protocol for new rhythm.
2. Return of spontaneous circulation: anti-arrhythmic bolus (if not already done) and drip.
<table>
<thead>
<tr>
<th>OVERALL:</th>
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<tbody>
<tr>
<td>ABC's</td>
</tr>
<tr>
<td>VITAL SIGNS</td>
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<tr>
<td>O2 THERAPY</td>
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<tr>
<td>CARDIAC MONITORING</td>
</tr>
<tr>
<td>HISTORY OF PREVIOUS HEART CONDITION</td>
</tr>
<tr>
<td>DIABETES</td>
</tr>
<tr>
<td>HYPERTENSION</td>
</tr>
<tr>
<td>STROKE</td>
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<tr>
<td>MEDICATION</td>
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<thead>
<tr>
<th>QUALITY:</th>
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</thead>
<tbody>
<tr>
<td>PRESSURE / SQUEEZING</td>
</tr>
<tr>
<td>TIGHTNESS / HEAVINESS</td>
</tr>
<tr>
<td>DISCOMFORT</td>
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<tr>
<td>BURNING</td>
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<tr>
<td>SHARP</td>
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<tr>
<td>ACHING</td>
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<table>
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<tr>
<th>UNCOMFORTABLE FEELING:</th>
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<tbody>
<tr>
<td>PAIN SCALE 0-10</td>
</tr>
<tr>
<td>0 = NO PAIN / DISCOMFORT</td>
</tr>
<tr>
<td>10 = WORST PAIN / DISCOMFORT</td>
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<thead>
<tr>
<th>RADIATION:</th>
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<tbody>
<tr>
<td>LEFT OR RIGHT AREA</td>
</tr>
<tr>
<td>BACK</td>
</tr>
<tr>
<td>JAW</td>
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<tr>
<td>ANYWHERE AT ALL</td>
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<table>
<thead>
<tr>
<th>VARIATION:</th>
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</thead>
<tbody>
<tr>
<td>CHEST VARIATION</td>
</tr>
<tr>
<td>WITH DEEP INSPIRATION</td>
</tr>
<tr>
<td>PAIN INCREASED / CHANGED WITH BODY POSITION</td>
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<table>
<thead>
<tr>
<th>SIGNS / SYMPTOMS:</th>
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<tbody>
<tr>
<td>NAUSEA</td>
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<tr>
<td>VOMITING</td>
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<tr>
<td>DIAPHORESIS</td>
</tr>
<tr>
<td>ANXIETY</td>
</tr>
<tr>
<td>SHORTNESS OF BREATH</td>
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<tr>
<td>DIZZINESS</td>
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<tr>
<th>WORSE:</th>
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<tbody>
<tr>
<td>PAIN REPRODUCED / WORSE WITH PALPATION</td>
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</tbody>
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<table>
<thead>
<tr>
<th>TIMING / DURATION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEN DID THE PAIN BEGIN?</td>
</tr>
<tr>
<td>WHEN DID THE PAIN END?</td>
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<tr>
<td>DOES IT COME &amp; GO?</td>
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<tr>
<th>EXITING:</th>
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<tbody>
<tr>
<td>PAIN LASTS</td>
</tr>
<tr>
<td>FEW, FLEETING, SEVERE</td>
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</table>

**Table 1**  **NOTE:** patients with chest pain of cardiac origin can have atypical pain. Atypical characteristics of the patient’s chest pain **does not rule out myocardial ischemia or infarction.**

A. In Table 1, V-X are possible signs of non-cardiac pain/discomfort. If any of these signs are present, you may want to contact Medical Control before beginning treatment (NTG, ASA) for the chest pain. Keep in mind however, that many patients, especially the elderly over 75, with chest pain of cardiac origin, have atypical pain on presentation. In fact, a significant number of patients suffering myocardial infarction report an increase in their pain with palpation of their chest. Atypical characteristics of the patient’s chest pain **does not rule out myocardial ischemia / infarction.** Assessment of chest pain should include the patients’ risk factors when MI is being considered; Hx CAD, Diabetes, HTN, Smoking, Obesity, Family Hx of heart disease, females post menopausal, cocaine use just prior to pain, advanced age.

B. Chest pain that is not believed to be cardiac in nature does not warrant being treated with NTG and ASA, and therefore is not recommended.
C. Complications of Infarct:

Once a 12 lead EKG has been obtained and the suspected area localized, then one can anticipate certain complications.

<table>
<thead>
<tr>
<th>Right Coronary Artery</th>
<th>Left Coronary Artery</th>
</tr>
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<tbody>
<tr>
<td>AV Node</td>
<td>Bundle Branches</td>
</tr>
<tr>
<td>Right Ventricle</td>
<td>Septum</td>
</tr>
<tr>
<td>Inferior Wall</td>
<td>Anterior Wall</td>
</tr>
<tr>
<td>Posterior Wall</td>
<td>Lateral Wall (posterior wall)</td>
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</tbody>
</table>

Right Occlusions:
Approximately 40% of all inferior infarctions also involve the right ventricle (proximal right artery occlusion). It is important to recognize the presence of right ventricular infarction. Whenever inferior wall infarction is suspected (ST Elevation in leads II, III, AvF) a right sided EKG should be performed.

**Right Ventricular Infarction**
- 50% likelihood of AV block at level of AV node (narrow QRS, AV node is downstream from occlusion)
- Often responds to atropine, if treatment needed
- May be “sensitive” to nitroglycerine (preload dependant)
- Avoid vasodilators
- Hypotension may respond to fluid therapy (assess lung sounds frequently)

**Left Coronary Artery Occlusions**
- New onset of BBB 65% mortality (LAD supplies bundle branches)
- AV block below AV node (wide QRS) be ready to pace
- Hypotension should be treated with vasopressors (250cc-500cc fluid bolus may be of benefit)

Leads showing changes

<table>
<thead>
<tr>
<th>Localization</th>
<th>Hypotension Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1-V6</td>
<td>250cc-500cc fluid bolus</td>
</tr>
<tr>
<td>Leads I, AvL</td>
<td>Dopamine</td>
</tr>
<tr>
<td>II, III, AvF</td>
<td>500cc-1000cc fluid bolus (may require more)</td>
</tr>
<tr>
<td>V4, 5, 6 R (right ventricle)</td>
<td>Dopamine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain Control</th>
<th>A-V Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTG and MS appropriate</td>
<td>QRS Usually &gt; 120 ms</td>
</tr>
<tr>
<td>NTG and MS used with caution (in RVI)</td>
<td>Atropine or pacing</td>
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<th>QRS Usually &lt; 120 ms</th>
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CHEST PAIN

Transport to the **MOST** Appropriate facility

**Basic**
- Assess ABCs; (Follow NREMT BLS standards)
- Oxygen; pulse oximetry (if available)
- If systolic BP > 100; administer Nitrotab or Nitrospray x 1, SL:
  - Reassess VS and symptoms after Rx and Q 5 min enroute
  - Contact Medical Control;
- Rapid transport; consider mutual aid/air evacuation

**Intermediate**
- Basic +
- IV NS @ KVO if time allows draw blood per protocol
- If systolic BP > 100; apply 2 in. Nitropaste, TD
  - Contact Medical Control
- 12 Lead EKG if inferior changes are noted perform right sided EKG (if time allows)
- If pain persist without relief; Morphine Sulfate 2mg IV Q5 minutes until pain is <4 maximum 2 doses
  - Contact Medical Control Transmit 12 Lead EKG enroute, (if available)

**Paramedic**
- Basic + Intermediate+
- Monitor ECG
- 12 Lead EKG if inferior changes are noted perform right sided EKG (if time allows)
- If pain persist without relief; Morphine Sulfate 2mg IV Q5 minutes until pain is <4 maximum 2 doses
  - Contact Medical Control Transmit 12 Lead EKG enroute, (if available)

*Any Patient male or female that has taken Viagra, Cialis, or Levitra in the last 24-36 hours, shall not receive any form of Nitrates (NTG)
A. DO NOT begin resuscitation if death criteria are present.

B. The senior EMS person (by rank and/or training) on the scene is responsible for supervising the establishment and documentation of death criteria in a given patient.

C. If possible, the scene should not be disturbed any more than is required to care for any other victims that may be present.

D. As soon as possible, the scene should be turned over to law enforcement personnel or appropriate authorities.

E. THE FOLLOWING FINDINGS, ALONE OR IN COMBINATION, ARE REQUIRED TO BE PRESENT IF A PATIENT IS TO BE DECLARED DEAD AT THE SCENE:

1. Decomposition.
2. Decapitation.
3. Severe dependent lividity.
4. Rigor mortis.
5. Injuries to brain and cardiovascular system incompatible with life.
6. Incineration (burned beyond recognition).
7. Obvious, severe blunt trauma (without vital signs, pupillary response, or an organized or shockable cardiac rhythm at the scene.)
8. Prolonged down time (without vital signs, pupillary response, or an organized or shockable cardiac rhythm at the scene.)
9. Appropriate documentation of valid DNR (no-CPR) order.

If there is ever any question or doubt, begin resuscitation efforts immediately. Contact medical control for termination of efforts according to ACLS protocol if needed.

A PEMSS patient form should be filled out on all patients pronounced dead by this protocol. The pink copy can be left at a healthcare facility for their records, i.e. Nursing Home. The PEMSS report copy cannot be given to any unauthorized individuals that is not included in the continuum of care. (law enforcement)