Adult Cardiac Care
(Section C)
(C-1) Acute Coronary Syndrome

1) Basic EMT - assist patient with their meds as follows;
   a) Oxygen and frequent vital sign assessment
   b) **NTG SL** 1 tablet of the patients medicine every 5 minutes as long as patient B/P is above 90mmHG up to three doses.
2) Intermediate EMT may establish IV access and draw labs. (Limit IV sticks if patient candidate for thrombolytic therapy in conjunction with the above.
3) Paramedic EMT - do the following;
   a) O2, IV, cardiac monitor
   b) Obtain **12 lead** to determine if MI exists and if patient is a candidate for code STEMI.
   c) **ASA** to all patients not allergic and w/o contraindications @ **324mg** or 4 baby ASA chewed by mouth. (Goal is within five minutes of arrival)
   d) Give **NTG SL 1 tablet or 2 sprays**. Repeat with continuing pain and B/P > 90mmHg systolic q 5 minutes.
   e) Apply **NTG Nitro paste (15mg)** to patient bare chest 1 inch of 2% paste.
   f) NTG SL and Nitro paste should be used concurrently
4) NTG of any type should not be given if patient vital status will not support it. B/P must be greater than 90mmHg prior to administration and should be recorded before and after.
5) **Contact medical control** for **Morphine Sulfate** 2 to 10 mg slow IV push (no more 3mg/min). Indicated for patients not responsive to nitrate therapy and who are still hemodynamically stable.
6) Be cautious with patient using **Viagra** < 24 hours, **Cialis** < 48 hrs or other over the counter ERD drugs when using nitrates.
7) **Emesis**--Administer 4-8mg Zofran IV slow IV push.
   a) Watch for headache, fatigue, dizziness.

REMEMBER: COMPLETE PAIN RELIEF IS THE GOAL OF PRE-HOSPITAL CARDIAC CARE. TIME IS MUSCLE AND SCENE TIMES GOALS SHOULD BE LIMITED TO LESS THAN 15 MINUTES.

Encourage all Code STEMI patients to be transported to SRMC by using sound rationale about the care that is available in heart services.

(C-2) Code STEMI

1) **Two or more consecutive leads that have 0.5mm or greater elevation.**
   a) **Notify ER that this is a CODE STEMI**
   b) **Limit scene time to less than 15 minutes.**
   c) **Do the Fibrinolytic Therapy check sheet.**
   d) **Follow the ACS protocol (C-1)**
   e) **I See All Leads**
      i) **Inferior II, III, AVF**
      ii) **Septum V1, V2**
      iii) **Anterior V3,V4**
      iv) **Lateral I, AVL, V5, V6**
   f) **Remember to do V4R if you have II, III and AVF to look for right side involvement. If so use caution with Nitrates**
   g) **Remember V1-V4 depression is possibly a posterior infarct do V7, V8 and V9 on the back of chest to R/O possible code STEMI.**

Inferior infarcts inhibit good preload in your Cardiac Output equation. Heart rate x Stroke Volume can be further broken down to preload and after load. With Inferior infarcts be prepared to support preload with volume boluses.

(C-3) Congestive Heart Failure
Associated Pulmonary Edema

1) O2, IV & Cardiac Monitor
2) With acute respiratory distress consider **CPAP** see (CPAP Protocol)
3) Obtain 12- lead to R/O AMI
4) R/O infectious process
5) If Wheezing present refer to Reactive Airway (M-16)
6) Consider CPAP
7) **NTG SL** may be given **1 tablet or 2 sprays** per dose up to three as long as patient B/P will support
   a) One inch of **2% nitro paste (15mg)** applied to patient bare chest.
      i) BP must be greater than 90mmHg systolic.
      ii) If hypotension develops, wipe the paste off of patient's chest.
8) **Furosemide 1mg/kg** slow IV push or 1.5 times the patient daily dose to a max of 120mg.
9) **Contact medical control** to request **Morphine Sulfate 2 to 10 mg.** BP must be greater than 90mmHg systolic.
10) **Dopamine** may be considered **2 to 20mcg/kg/min** to support pressure. **Alternative mix ratio** may be used: 400mg into 250cc NS gives a **1600mcg:1cc concentration**. @15gtt/min-400mcg/min @30gtt/min-800mcg/min @ 45gtt/min-1200mcg/min @60gtt/min1600 mcg/min, keep in mind that Dopamine is weight based and that the above is a reference to ensure that your infusion rate makes sense.

(C-4) ATRIAL FIBRILLATION/ATRIAL FLUTTER

Associated with rapid ventricular response

Stable with signs and symptoms as follows i.e. Chest pain, SOB etc:

1) ALS care to include **O2, IV**, and **monitor.**
2) **12 lead** to determine the rhythm diagnosis.
3) Consider **Lopressor 5mg** IV push
   a) May repeat **Lopressor 5mg** once

Unstable with shock and serious signs and symptoms;

1. **Synchronized cardioversion**-
   a. Begin at **100 joules** and increase as needed to obtain desired effect. **(200, 300, 360 joules)**

2. **Midazolam 2.5-5 mg** slow IV push maybe used for sedation, if needed, for cardioversion.
   a. Pt's B/P must be greater than 90 mmHG systolic to give Versed and patient needs to have an LOC that would warrant sedation.

Atrial fibrillation is often associated with Wolfe- Parkinson- White syndrome and Adenosine and Cardizem should be avoided in these patients as it will increase the rate of the bypass circuit

(C-5) Supraventricular Tachycardia

Stable with serious signs and symptoms i.e. chest pain, SOB, etc:

1. ALS procedures to include **O2, IV**, and **cardiac monitor**.
2. **12 lead** ECG to confirm rhythm.
3. Have the patient attempt **vagal** maneuvers (valsalva maneuver).
4. **Adenosine 12mg** rapid IV push (1-3 sec). Flush aggressively with10-20cc of NS.
5. **Adenosine 12mg** rapid IV push (1-3 sec) within 1-2 minutes of 1st dose if rate is not controlled. Flush aggressively with 10-20cc of NS.
6. If the Adenosine fails, consider **Lopressor 5mg** IV push
   a. May repeat **Lopressor 5mg** once

Unstable SVT

1) Synchronized cardioversion @ **100 joules**.
   a) If unresponsive to 100 joules then escalate as follows **200, 300, 360 joules.**
2) **Midazolam 2.5-5 mg** slow IV push may be used, given over two minutes for sedation.
   a) Patient's B/P must be greater than 90 mmHg systolic and mental status must warrant sedation.

(C-6) Ventricular Tachycardia/Wide complex tachycardia

Hemodynamically Stable patients:

1. ALS procedures to include **O2, IV** and **cardiac monitor.**
2. **12 lead** confirmation of rhythm.
3. **Amiodarone 150 mg** IV bolus given over 10 minutes.
   a. May repeat the **Amiodarone 150 mg IV** bolus as needed after 10 minutes as needed for recurrent or resistant arrhythmias.
   b. **Bolus –**Mix Amiodarone 150mg into 100 cc of NS and infuse @ 100gtts/min with 10gtt/set.
   c. **Amiodarone** continuous infusion **1mg/min** for six hours
      i. **Maintenance infusion** – Mix Amiodarone 150mg into 100cc and infuse at 40gtts/min. Dose is 1 mg/min with 60gtt/set.

   ****Amiodarone is first line agent****

4. If, for any reason, the patient should not receive Amiodarone (i.e., allergies, etc) then administer the following:
   a. **Lidocaine 0.5mg/kg-1.0mg/kg**.
      i. May repeat at half the initial dose q 5 minutes (max dose of 3mg/kg).
      ii. Maintenance infusion – **Lidocaine 1-4 mg/min.**

   b. **Procainamide** is also acceptable @ **30 mg/minute** until one of the following occurs:
      i. Arrhythmia is suppressed
      ii. QRS widens by 50%
      iii. Hypotension develops
      iv. 17mg/kg max dose has been given

c. Mix Procainamide 1 gram into 100ml of N/S with 10 gtt/set at 30gtt/min.
d. Maintenance infusion 1 gram into 250cc at 30 gtt/min with 60gtt/set

5. Wide complex tachycardia that is of uncertain type not responding to ventricular antidysrhythmics may be administered **Adenosine 12mg** and repeat **Adenosine** once at **12mg** in 1-2 minutes if no response to initial dose.

    a. Use only one antidysrhythmic in a patient with a pulse, as combining them may cause pro-arrhythmic effects.

Unstable patients;

1. Synchronized cardioversion @ **100 joules**.
    a. If no response, escalate as follows **200, 300, 360 joules**.
    b. **Midazolam 2.5-5 mg** may be used, if needed, to sedate patient. Patient B/P must be greater than 90mmHG and warrant sedation.

PVC's are not routinely treated by EMS pharmacologically. If patient condition warrants pharmacological therapy contact medical control for advice keep in mind that high –flow oxygen will rid most patients of PVC's prior to need for other drug therapy.

(C-7) Polymorphic Ventricular Tachycardia

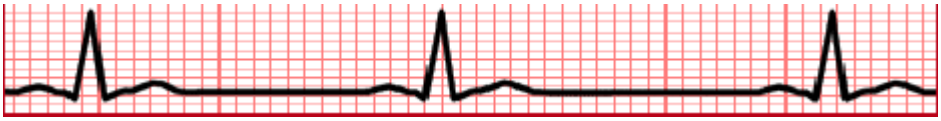
Patients with a pulse and hemodynamically stable:

1. **Magnesium Sulfate 1-2** grams given over 1-2 minutes.

Unstable (Serious signs and symptoms):

1. **Unsynchronized cardioversion @ 200 joules**. (Defibrillation)
    a. If patient becomes pulseless or apneic, follow VF/VT algorithm.

(C-8) Symptomatic Bradycardia



1) Symptomatic Bradycardia: (mild hypotension, altered mental status, pulmonary edema, chest pain, etc.):
   a) Ensure normal volume status; consider administering a **fluid challenge** of **300-500ml** boluses if patient history or condition warrants
   b) **12 lead** diagnosis to confirm origin of rhythm and rule out AMI. **If MI exists, avoid using Atropine**.

2) Trancutaneous pacing;
   i) Set rate at **80bpm** and increase milliamps as indicated until electrical capture obtained. Ensure that mechanical capture is present by palpating a pulse with each pacer spike.
   ii) **TCP** should be a **first- line intervention** on any patient requiring heart rate acceleration if no IV access readily available.
   iii) **Midazolam at 2.5-5 mg** should be given over 2 minutes to sedate patients that warrant sedation.
3) Administer **0.5mg of Atropine** every 5 minutes up to max dose of 3mg.
4) **Dopamine 2-20mcg/kg/min** for patients unresponsive to atropine and/or TCP to maintain a BP of above 90mmHg systolic.
   i) **Dopamine** should be mixed **200 mg in 250cc** of NS using a 60 gtt/set. This will be an 800mcg:1cc concentration @ 15gtts/min-200mcg/min @30gtt/min-400mcg/min @45gtt/min-600mcg/min @60-800gtt/min. This is just a guide to help you be in the range. Dopamine is weight based.

Cardiac Arrest

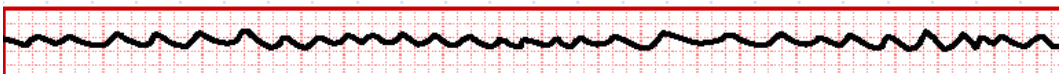
(CA-1) Guidelines for Cardiac Arrest

1. CPR takes precedence over all advanced care,
   30:2 is ratio for all adult patients 1or 2 rescuer. Once advanced airway in place perform 100 compressions a min with no pause for ventilations. Ventilations should be performed @ 8-10/min with ETT in place.
2. Remember, for an unwitnessed cardiac arrest- CPR for 2-3 minutes prior to defibrillation.
3. IO access early and may be used first –line on all cardiac arrests where an IV site is not readily visible.
4. Remember CPR after defibrillation for 2 minutes prior to pulse or rhythm check.
5. Prepare drugs in advance and deliver drugs as close to rhythm checks as possible. Perform CPR while defibrillator is charging. Interruptions in CPR should only be for ventilations (until advanced airway in place), rhythm checks, and actual delivery of shocks. Interruptions should be no more than 10-15 seconds.
6. Termination of resuscitation where adequate BLS has been performed requires online medical control

(CA-2) Ventricular Fibrillation/Ventricular Tachycardia

BLS CARE CPR TAKES PRECEDENCE OVER ANY ADVANCED PROCEDURE AND SHOULD BE MINIMALLY INTERRUPTED DURING RESUSCITATION AT A RATIO OF 30:2 FOR 1 or 2 RESCUERS, SWAPPING POSITIONS EVERY 2-3 MINUTES.

VENTRICULAR FIBRILLATION/PULSE-LESS VENTRICULAR TACHYCARDIA



1) Witnessed arrest- the pt should be immediately defibrillated.
2) Unwitnessed arrest –the pt should receive 2-3 minutes of effective CPR prior to defibrillation.
3) **Defibrillation** should be @ **200 J** biphasic (360 J monophasic)
4) CPR should be performed for 2 minutes post defibrillation prior to rhythm confirmation or pulse check.
5) Airway maintenance using most appropriate method
   a) Any advanced airway should have EtCO2 continuous monitoring in combination
6) The drug/shock sequence is still the standard, however do not pause CPR to give drugs. Pause only for d-fib, rhythm confirmation or pulse check.
7) **Epinephrine** should be administered **1mg** 1:10,000 q 3-5 minutes.
8) Consider **Epi Infusion of 0.3mg/min** Contact Medical control for order
   a) Mix 30 mg of Epinephrine into 100ml of N/S use 10gtt/set @ 10 gtt/min
9) **Amiodarone 300mg** rapid IV push (1st line antidysrhythmics.)
      i) Repeat **Amiodarone @ 150mg** once in 3-5 min if rhythm unchanged.
10) Lidocaine may be used, once Amiodarone has been maxed out.
   a) **Lidocaine** arrest dose **1-1.5mg/kg**
   b) Repeat **Lidocaine** at half initial dose **0.5-0.75mg/kg** q 3-5 min if rhythm unchanged.
   c) Max dose of Lidocaine is 3mg/kg
11) A **maintenance drip** should be initiated of whichever antidysrhythmic converts rhythm.
   a) **Amiodarone** continuous infusion **1mg/min** for six hours
      i) **Maintenance infusion** – Mix Amiodarone 150mg into 100cc and infuse at 40gtts/min. Dose is 1 mg/min with 60gtt/set.
      ii) **Lidocaine, Procainamide** are mixed 1 gram in 250 ml bag of fluid and started with a 60gtt/set at 30gtt/min
12) The following drugs can be considered in special situations as defined:
   a) Hypomagnesemia, chronic alcoholism or recurrent VF/VT- administer **Magnesium Sulfate 1-2** grams over 1-2 minutes.
   b) **Sodium Bicarb 1 mEq/kg up** to 50 mEq for patient with suspected metabolic acidosis, presumed hyperkalemic arrest.
   c) .**Calcium Gluconate 1-2 grams 10-20ml** of a 10% solution for suspected metabolic acidosis or hyperkalemic arrest.

(CA-3) Pulseless Electrical Activity

BLS CARE CPR TAKES PRECEDENCE OVER ANY ADVANCED PROCEDURE AND SHOULD BE MINIMALLY INTERRUPTED DURING RESUSCITATION AT A RATIO OF 30:2 FOR 1 OR 2 RESCUERS, SWAPPING POSITIONS EVERY 2-3 MINUTES.

1) Airway maintenance using most appropriate method
   a) Any advanced airway should have EtCO2 continuous monitoring in combination
2) Check for pulse by palpating and auscultating at the apex of the heart
3) **Epinephrine 1mg** 1:10,000 IV push q 3-5 minutes
4) **Atropine 1mg** can be given for heart rates less than 60, w/max total dose of 3mg.
5) Rule out possible causes of PEA. See list at end of section.
6) The following drugs can be considered in special situations as defined:
   a. Hypomagnesemia, chronic alcoholism or recurrent VF/VT –administer **Magnesium Sulfate 1-2 grams** over 1-2 minutes.
   b. **Sodium Bicarb 1 mEq/kg up** to 50 mEq for patient with suspected metabolic acidosis, presumed hyperkalemic arrest.
   c. **Calcium Gluconate 1-2 grams** of a 10% solution for suspected metabolic acidosis or hyperkalemic arrest.

(CA-4) Asystole

CPR TAKES PRECEDENCE OVER ANY ADVANCED PROCEDURE AND SHOULD BE MINIMALLY INTERRUPTED DURING RESUSCITATION AT A RATIO OF 30:2 FOR 1OR 2 RESCUERS, SWAPPING POSITIONS EVERY 2-3 MINUTES.

******Confirm Asystole in more than one lead to rule out fine v-fib******

1) Airway maintenance using most appropriate method
   a) Any advanced airway should have EtCO2 continuous monitoring in combination
2) **Epinephrine 1mg** 1:10,000 q 3-5 minutes rapid IV bolus.
3) **Atropine 1mg** rapid IV bolus q 3- 5 minutes with max total dose of 3 mg.
4) Consider termination of efforts if patient is not responding.
5) The following drugs can be considered in special situations as defined:
6) Hypomagnesemia, chronic alcoholism or recurrent VF/VT- administer **Magnesium Sulfate 1-2 grams** over 1-2 minutes.
7) **Sodium Bicarb 1mEq/kg** up to 50 mEq for patient with suspected metabolic acidosis, presumed hyperkalemic arrest.
8) **Calcium Gluconate 1-2 grams** of a 10% solution for suspected metabolic acidosis or hyperkalemic arrest.

Consider and treat the following in both Asystole and PEA: **SEE NEXT PAGE**

Hypoxia (high flow O2)
Hypovolemia (Fluid or dopamine)
Acidosis (Bicarb)
Thrombus (consider AMI or PE)
Tamponade (Look for S&S)
Hypothermia (blankets and removes wet clothes)
Hypo/hyperkalemia (Bicarb or Calcium Gluconate)
Drug OD (Appropriate reversal agent see protocol**)**
Trauma (fluid or decompression)
Hypoglycemia (See protocol)

(CA-5) Hypothermic Arrest

If the patient is a confirmed hypothermic arrest the following guidelines apply:

1) Defibrillate once @ 200j biphasic (once only until pt is warmed)
2) If core temperature is less than 86f
   a) Continue CPR
   b) Withhold all but first line drugs
   c) Epinephrine 1:10000 1mg IV once
   d) Amiodarone 300 mg IV push
   e) Treat hypoglycemia according to algorithm
3) Mild Hypothermic arrest (above 86f)
   a) CPR
   b) Normal ACLS algorithm for assessed rhythm but longer intervals between drug therapies.
   c) Defibrillation as indicated in standard algorithm

(CA-6) Traumatic Cardiac Arrest

Traumatic cardiac arrest is usually associated with either a circulating volume problem or an airway/ventilation problem that is uncorrected for a period of time. Use the following guidelines when treating a patient presumed in traumatic arrest

1) Rapid trauma assessment to determine ABC's
2) Support ABC's with CPR provide rapid immobilization for transport to definitive care
3) More emphasis should be placed on volume resuscitation and aggressive airway support than pharmacology
4) Utilize good paramedic assessment to decide if a medical event may have preceded the trauma. If so see appropriate algorithm
5) If patient is not responding favorable then bilateral pleural decompression should be considered

(CA-7) Cardiac Arrest with Pregnancy

Cardiac arrest associated with pregnancy should have the following modifications.

1. After 20 weeks gestation the patient should be placed at a 15-30 degree side ways angle to avoid compression of the inferior Vena Cava. An alternative is to pull or push to the side the fetus by gently pushing the patient's belly
2. CPR should be performed slightly higher on the sternum to account for the physiological changes that the patient has gone through.
3. Be prepared to use a slightly smaller tube than for a non pregnant patient.
4. Follow normal ACLS guidelines for the presenting rhythm

(CA-8) Post-Resuscitative care

Post- resuscitative care is directed at vital support. Maintain a perfusing pressure and adequate oxygen saturation.

1) Reevaluate vital status often
   a) Monitor MAP
   b) Avoid hyperventilation as it will worsen hypotension and reoccurrence of arrested state
2) Consider induced hypothermia to preserve brain function see protocol (CA-9)
3) **Fluid boluses of 300-500cc** NS as necessary to ensure normal volumetric status.
4) **Dopamine 2-20mcg/kg/min-** for patients unresponsive to or ineligible for fluid bolus or for bradycardic patients unresponsive to atropine and/or TCP to maintain a BP of above 90mmHg systolic.

   a) **Dopamine** should be mixed **200 mg in 250cc** of NS using a 60 gtt/set. This will be an 800mcg:1cc concentration @ 15gtts/min-200mcg/min @30gtt/min-400mcg/min @45gtt/min-600mcg/min @60gtt/min-800gtt/min

5) Antidysrhythmics are contraindicated in the post resuscitative phase unless there is a dysrhythmia present. If so see appropriate algorithm
6) Hang the appropriate antidysrhythmic infusion if utilized during the arrest.

7) **Maintenance infusion as follows**;

   i) Lidocaine 1 gram in 250cc of NS creates 4:1 concentration begin at 30gtt/min
   ii) Amiodarone 150mg in 100cc NS infused at 40gtt/min with 60gtt/set
   iii) Magnesium Sulfate 1 gram in 250cc of NS infuse at 30gtt/min with 60 gtt/
   iv) Procainamide 1 gram in 250cc of NS creates 4:1 concentration begin at 30gtt/min

(CA-9) Induced Hypothermia

This protocol should be considered on any patient who has a return of spontaneous circulation (ROSC) following a medical cardiac arrest.

1) The patient should meet the following criteria;
    i) ROSC following a medical cardiac arrest
    ii) 18 years old and above
    iii) Intubated patient with no purposeful response to pain
    iv) If Patient is not intubated refer to RSI protocol.

2) If the above criteria are met follow the protocol below.
    i) Confirm ETT placement via EtCO2 device
    ii) Perform a disability exam to ensure that the patient is unresponsive
        (a) No purposeful response to pain
    iii) Expose patient and apply ice packs to Axilla and Groin

3) If patient does not require RSI consider the following;
    i) Administer Versed as follows;
    ii) Administer Versed 0.1 mg/kg up to 5 mg IV administer; 1 mg if systolic BP is less than 90 systolic
    iii) May also consider Valium 5-10mg IV or Lorazepam 2-4mg IV

4) Administer Norcuron 0.1mg/kg max of 10 mg

5) Infuse a cold saline bolus of 30ml/kg up to 2 liters

6) **Dopamine** may be considered **2 to 20mcg/kg/min** to support pressure. MAP needs to be maintained around 90-100. **Alternative mix ratio** may be used: 400mg into 250cc NS gives a **1600mcg:1cc concentration**. @15gtt/min-400mcg/min @30gtt/min-800mcg/min @ 45gtt/min-1200mcg/min @60gtt/min1600 mcg/min, keep in mind that Dopamine is weight based and that the above is a reference to ensure that your infusion rate makes sense.
    i) MAP=1/3 pulse pressure + Diastolic B/P

7) Notify SRMC ER and request Code Freeze. NOTE All Code Freeze patients must go to SRMC.
8) This protocol should be applied along with the post resuscitative care (CA-8).

If the patient's condition deteriorates and returns to cardiac arrest once cooling is initiated stop the cooling process and go to appropriate algorithm to treat the arrest.