The following protocol is intended for the systematic treatment of common cardiac dysrhythmia and cardiac arrest scenarios.

**CPR Guidelines**

CPR will be performed according to the most current American Heart Association (AHA) standards. Always keep in mind that high quality CPR with uninterrupted chest compressions is the top priority when attempting to resuscitate a pulseless and apneic patient. When performing CPR, the following guidelines will be adhered to:

1. Perform **chest compressions** at least 2” (5cm) to 2.4” (6cm) deep and at a rate of **100 to 120/min**.

2. Allow for full **chest recoil** after each chest compression by not leaning on the chest.

3. High quality chest compressions are achieved when the ETCO2 value is at least **10-20 mmHg**.

4. **MINIMIZE INTERRUPTIONS** in chest compressions.
   a) All cardiac arrests will be worked for at least **20 minutes** on scene prior to attempting to move or transport the patient.

5. **Avoid excessive ventilation**:
   a) When ventilating without an advanced airway, perform cycles of 30 compressions with a short pause to administer 2 breaths per cycle.
   b) When an advanced airway is in place, provide continuous compressions at a rate of at least **100 to 120/min** and ventilate the patient once every 6 seconds.

**BLS CPR (With AED)**

1. Initial Assessment [Protocol 01]
   a) Assess for responsiveness.
   b) Simultaneously perform some steps (ie, checking for breathing and pulse at the same time), in an effort to reduce the time to first chest compression.

   *The initial assessment should take no more than 10 seconds to complete.*

2. If the patient has a pulse but is not breathing:
   a) Open the airway and provide rescue breaths once every 6 seconds. Reassess for a pulse every 2 minutes.
3. If the patient has no pulse:
   a) Perform 200 chest compressions (2 minutes) with passive ventilations only

   Insert an oral or nasopharyngeal airway and apply a non-rebreather mask at 15L/min. Only passive ventilations will be provided during these first 2 minutes.

   The Lucas Chest Compression device may be considered for prolonged resuscitation events after the initial 200 compressions have been delivered. Procedure 26

   b) After the first 2 minutes continue with 30 compressions and 2 ventilations for 5 cycles of CPR.

4. Attach the AED patches as soon as possible. Analyze the rhythm after the initial 200 compressions have been delivered. Shock as needed.
   a) Allow the AED to analyze the patient’s rhythm and shock as needed.
   b) Leave the AED on the patient and turned on throughout the resuscitation effort.
   c) The AED will prompt reassessment and rhythm analysis every 2 minutes.
   d) If a shock is advised, minimize interruptions in chest compressions before and after shock.
   e) Resume CPR beginning with chest compressions immediately after each shock.
Call for appropriate resources  
(Rescue or suppression for manpower)

Unresponsive

Give 1 breath every 6 seconds
Check pulse every 2 minutes

Check breathing and Pulse Simultaneously  
(<10 seconds)

Has Pulse

Give 1 breath every 6 seconds
Check pulse every 2 minutes

No Pulse

Begin 200 uninterrupted compressions with passive ventilations

Apply AED/Defibrillator pads as soon as possible

Analyze rhythm
Shockable Rhythm?

Shockable

Give 1 shock
Resume CPR immediately for 2 minutes

Non-shockable

Resume CPR immediately for 2 minutes
Check rhythm every 2 minutes
Continue until ALS arrives

Advanced Airway
After placement of an advanced airway compress the chest at a rate of 100 to 120/min and ventilate at a rate of one breath every 6 seconds without pauses in-between compressions and breaths

Passive Ventilations
Insert an oral/nasal airway and apply a NRB mask at 15L/min

High Quality CPR
• Rate 100 to 120/min
• Depth of 2" to 2.4" inches
• Do not “lean on the chest” allow for complete chest recoil
• Minimize interruptions to <10 seconds
• Avoid excessive ventilations

AED/Defibrillator Analyze
Apply pads as soon as possible, but do not analyze until first set of 200 compressions have been delivered

After 5 cycles of CPR

EMS DIVISION 9.3 Rev. 12/19/2016
ALS CPR with Monitor / Defibrillator, IV and Advanced Airway

1. Initial Assessment Protocol 01
   a) Assess for responsiveness. If the patient appears unresponsive:

2. Check for breathing and a pulse:
   a) Check breathing and pulse for no more than 10 seconds.
   b) If the patient has a pulse but is not breathing:
      Open the airway and provide ventilation with BVM (rescue breaths) once every 6 seconds (10 breaths/minute). Reassess for a pulse every 2 minutes.

3. If the patient has no pulse:
   a. Begin CPR with 200 uninterrupted chest compressions with passive ventilations. Two (2) minutes of uninterrupted CPR.

      Insert an oral or nasopharyngeal airway and apply a non-rebreather mask at 15L/min. Only passive ventilations will be provided during these first 2 minutes.

      The Lucas Chest Compression device may be considered for prolonged resuscitation events after the initial 200 compressions have been delivered. Procedure 26

4. Attach and turn on the Monitor / Defibrillator
   a) Apply the defibrillator pads and switch the monitor to “paddles”
   b) Analyze for a shockable rhythm after 200 compressions have been delivered.
      a. Ventricular Fibrillation (V-Fib or VF)
      b. Pulseless Ventricular Tachycardia (V-Tach or VT)
      c. Torsades De Pointes or Polymorphic VT
   c) If the patient presents with a shockable rhythm,
      a. Defibrillate at 360 joules every 2 minutes as needed
      b. Resume CPR beginning with chest compressions immediately after each shock 30 compressions 2 breaths for 5 cycles (2 minutes).
d) If the patient does not present with a shockable rhythm: **Resume CPR** beginning with chest compressions after each reassessment

5. **Establish vascular access via IV or IO** as soon as possible without delaying chest compressions.
   a) Deliver medications in accordance with the rhythm based protocol the patient is being treated under (Sections A, B, C, D, E, or F)

6. **Secure an advanced airway** [Protocol 07](#) as soon as possible without delaying chest compressions.

7. Attach and monitor **End Tidal CO₂** and waveform capnography [Procedure 11](#)
A. Ventricular Fibrillation / Pulseless Ventricular Tachycardia (VF/pVT)

For a patient in VF/pVT, initially perform 200 uninterrupted chest compressions. Establish IV / IO access as soon as possible.

1. **Defibrillate at 360 joules** and repeat defibrillation every 2 minutes
2. Administer **Epinephrine, 1 mg**, IV/IO push, circulate with 2 minutes of CPR
3. **Defibrillate at 360 joules**. Resume CPR
4. Administer **Amiodarone 300mg**, IV/IO push, circulate with 2 minutes of CPR
5. **Defibrillate at 360 joules**. Resume CPR

*Consider an advanced airway, capnography (ETT or i-Gel) (Procedure 9) (Procedure 49)*
6. Administer **Epinephrine, 1 mg** IV/IO push, circulate with 2 minutes of CPR
7. **Defibrillate at 360 joules**. Resume CPR
8. Administer **Amiodarone 150mg** IV/IO push, circulate with 2 minutes of CPR
9. **Defibrillate at 360 joules**. Resume CPR
10. Administer **Epinephrine, 1 mg** IV/IO push, circulate with 2 minutes of CPR
11. **Defibrillate at 360 joules**. Resume CPR for 2 minutes
12. If the rhythm fails to convert, continue CPR with Epinephrine IV/IO every 3-5 minutes and defibrillation as needed.
   a. At any time consider underlying causes and manage as indicated in “Potentially Reversible Causes in Cardiac Arrest” (H’s and T’s) in section G.
   b. After 20 minutes additional antiarrhythmics such as **Lidocaine 1mg/kg (Up to a max of 3mg/kg) may be considered** if the patient remains in refractory VF or pulseless VT.
13. If patient is in polymorphic ventricular tachycardia (**Torsades de Pointes**). **Magnesium Sulfate 2g IV / IO over 1-2 minutes** may be given at any time after the first epinephrine.
14. After ROSC, refer to the Post Resuscitative Care Protocol (Section I)
15. If after pulses are restored patient develops malignant ventricular ectopy, (frequent PVCs > 10 per minute, Couplet PVCs, runs of VT) stabilize B/P ≥ 90 mmHg and administer **Amiodarone 150 mg IV over 10 minutes**.
16. If ROSC was achieved prior to the administration of an antiarrhythmic, administer **Amiodarone 150 mg IV over 10 minutes**.
Ventricular Fibrillation / Pulseless Ventricular Tachycardia

Initial Assessment
Protocol 1

Airway

CPR (2 MINUTES)

NO

Shockable Rhythm?
YES
360 J

Epinephrine every 3-5 min

NO

Shockable Rhythm?
YES
360 J

Amiodarone 300mg
IV/IO Push

Amiodarone 150mg
IV/IO Push

Continue CPR
EPI every 3-5 Minutes
Consider underlying causes
Reassess Pulse and Rhythm

Continue CPR → medication → defibrillation at 360 joules → continued CPR.

If after 20 minutes patient remains in VF/pVT, consider Lidocaine 1mg/kg (Up to a max of 3mg/kg)
If Torsades, administer Magnesium Sulfate 2g over 1-2 min

After ROSC maintain B/P ≥ 90 mmHg and administer Amiodarone 150 mg IV over 10 minutes for ventricular ectopy or if no antiarrhythmic has been administered.
B. Regular, Wide Complex Tachycardia with a Pulse

**UNSTABLE - Patient presents with CP, AMS, SOB, and/or HYPOTENSION BP < 90 mmHg**

1. If conscious, attempt to sedate by administering **Midazolam (Versed)**, 5mg IV / IM. DO NOT delay cardioversion to administer Versed if the patient is profoundly unstable.
2. Perform **Synchronized Cardioversion** until the rhythm is converted:
   a) 100 joules
   b) 200 joules
   c) 300 joules
   d) 360 joules
3. If no conversion, consider **Amiodarone 150 mg IV over 10 minutes**.
4. If the rhythm fails to convert, continue **synchronized cardioversion** at 360 joules every 2 minutes
5. Once patient converts, treat systolic B/P <90 mmHg with a fluid bolus of up to1000mL. If fluids are unsuccessful administer Dopamine 10mcg/kg/minute. Monitor patient’s B/P and lung sounds often.

**STABLE PATIENT**

1. Administer **Amiodarone 150mg IV over 10 minutes**. Mix 150mg (3mL) into a 50mL NS bag with a 10gtt/mL set and run at 60gtts/min may be repeated every 10 minutes.
2. If the patient's condition deteriorates at any time, move immediately to "**unstable adult patient**" above, or to VF/Pulseless VT, **Section A**.

Once conversion to a normal sinus rhythm has been achieved administer **Amiodarone 150 mg IV over 10 minutes. If the patient has significant PVC's** (follow section C)

**C. Premature Ventricular Complexes (PVC's)**

1. If the patient is having significant PVC's, without SOB, administer **Oxygen to maintain a saturation ≥ 94%**.
   a) Significant PVC's: Closely coupled (R on T), Multiform in configuration, Occurring in short bursts of two or more in succession, Ventricular tachycardia.
2. Administer **Amiodarone 150 mg IV over 10 minutes**.
3. If the PVC's re-occur administer a second dose of **Amiodarone 150 mg IV over 10 minutes** and initiate transport to the closest appropriate hospital with supportive care en-route.

**NOTE:** Amiodarone is contraindicated in patients taking Coumadin (Warfarin)
Regular, Wide Complex Tachycardia with a Pulse

Initial Assessment

STABLE

Regular or Irregular?

Regular (VT)

Amiodarone 150mg IV over 10 minutes

Convert

YES

Irregular

Treat Signs and Symptoms

Amiodarone 150mg IV over 10 minutes

UNSTABLE

Sedate with Versed if time allows

cardiovert

100 J - 200 J - 300 J - 360 J

B/P <90?

Fluid Challenge

B/P <90?

Fluid Challenge

B/P <90?

Dopamine
D. Narrow Complex Tachycardia HR ≥ 150 bpm

UNSTABLE - Patient presents with CP, AMS, SOB, and/or HYPOTENSION BP < 90 mmHg

1. Attempt to sedate by administering Midazolam (Versed), 5mg IV / IM. DO NOT delay cardioversion to administer Versed if the patient is profoundly unstable.

2. Perform Synchronized Cardioversion until the rhythm is converted:
   a) 100 joules
   b) 200 joules
   c) 300 joules
   d) 360 joules

3. If ascending cardioversions are unsuccessful, administer Adenosine per the Stable Section if not already administered.

4. If the rhythm fails to convert, continue synchronized cardioversion at 360 joules every 2 minutes

After successful conversion maintain O2 saturation ≥94% and treat hypotension if BP is < 90 mmHg with fluids (up to 1000ml NS IV) and possibly Dopamine (10mcg/kg/min)

STABLE PATIENT

DO NOT Administer Adenosine if ECG Rhythm is A-Fib or A-Flutter or if patient is taking Persantine or Aggrenox

1. Attempt Vagal Maneuvers

2. Administer Adenosine 6 mg Rapid IV (over 1-3 seconds)

   If Atrial fibrillation/Flutter is observed proceed to (section E) do not administer any additional doses of Adenosine.

3. If no change after 1 minute, repeat Adenosine 12 mg Rapid IV (over 1-3 seconds)

4. If no change after 1 minute administer Diltiazem 0.25 mg/kg slow IV over 2 minutes (maximum dose 20 mg)

If after 15 minutes, patient fails to convert clinical judgement may be used to determine if an additional dose of Diltiazem 0.35 mg/kg slow IV over 2 minutes (maximum dose of 25 mg) is required, or treat as unstable.
Narrow Complex Tachycardia

Initial Assessment Protocol 1

Regular or Irregular?

Regular (PSVT)

Vagal Maneuvers

Adenosine 6mg Rapid IVP

Convert?

YES

NO

Adenosine 12mg Rapid IVP

Convert?

YES

NO

Diltiazem 0.25 mg/kg to a max of 20 mg total. If no conversion may repeat after 15 minutes at 0.35 mg/kg to a max dose of 25 mg

Irregular (A-Fib)

Go to Section E.

Sedate with Versed if time allows

Cardiovert 100 J - 200 J - 300 J - 360 J

B/P <90?

Fluid Challenge

B/P <90?

Fluid Challenge

B/P <90?

Dopamine
E. Atrial Fibrillation/Atrial Flutter

Patients in atrial fibrillation/flutter with a rapid ventricular rate ≥ 150 bpm)

1. Oxygen to maintain a saturation of ≥ 94%
2. Start an IV of Normal Saline.

STABLE PATIENT

a. Administer Diltiazem 0.25 mg/kg slow IV push over 2 minutes (max 20 mg)

   If no conversion after 15 minutes:

b. Diltiazem 0.35 mg/kg slow IV push over 2 minutes (max 25 mg)

UNSTABLE - Patient presents with CP, AMS, SOB, and/or HYPOTENSION BP < 90 mmHg

MCP:  
c. Sedate patient if possible

d. Synchronized cardioversion

   1) 100 joules
   2) 200 joules
   3) 300 joules
   4) 360 joules

F. Asystole

Agonal Rhythm, Idioventricular rhythm with a rate ≤ 20 bpm, or Pulseless Bradycardias

a. Perform CPR

b. Establish TWO IV/IO lines as soon as possible.

c. Administer Epinephrine 1mg IV/IO every 3 Minutes

d. Administer Calcium Chloride, 1gram (1000mg) IV/IO SLOWLY over 1 minute.

e. Consider underlying causes and manage as indicated in “Potentially Reversible Causes in Cardiac Arrest” (H’s and T’s) in section H

f. Administer Sodium Bicarbonate 1mEq/kg IV in cases of preexisting metabolic acidosis is suspected such as in near drowning, renal dialysis, or DKA patients.*

*NOTE: DO NOT administer Calcium Chloride and Sodium Bicarbonate through the same IV tubing.
Asystole

- Perform CPR
- Airway Management
- IV / IO Access

Epinephrine 1mg IVP
every 3-5 minutes

Consider underlying cause

Calcium Chloride 1g IVP

Sodium Bicarbonate 1mEq/kg IVP
as indicated in protocol
G. Pulseless Electrical Activity (PEA)

1. Perform CPR

2. Administer Epinephrine 1mg IV / IO every 3 Minutes

3. Consider underlying causes and manage as indicated in “Potentially Reversible Causes in Cardiac Arrest” (H’s and T’s)

<table>
<thead>
<tr>
<th>Potentially Reversible Causes in Cardiac Arrest (H’s and T’s)</th>
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<tbody>
<tr>
<td>Hypovolemia</td>
</tr>
<tr>
<td>Fluid bolus of up to 1000mL, rapid transport</td>
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<tr>
<td>Hypoxemia</td>
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<tr>
<td>Confirm adequacy of oxygenation and hyper-oxygenate.</td>
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<tr>
<td>Hydrogen-ions (Acidosis)</td>
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<tr>
<td>Give Sodium Bicarbonate, 1 mEq/kg IVP/IO</td>
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<tr>
<td>Hypothermia</td>
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<tr>
<td>Warming of patient</td>
</tr>
<tr>
<td>Hypoglycemia</td>
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<tr>
<td>Treat per Protocol 14, Impaired Consciousness</td>
</tr>
<tr>
<td>Hyperkalemia</td>
</tr>
<tr>
<td>Calcium Chloride and/or Sodium Bicarbonate.</td>
</tr>
<tr>
<td>Tension Pneumothorax</td>
</tr>
<tr>
<td>Needle decompression per Procedure 5.</td>
</tr>
<tr>
<td>Tamponade, Cardiac</td>
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<tr>
<td>Dopamine 10mcg/kg/min.</td>
</tr>
<tr>
<td>(Toxin): Beta Blocker OD</td>
</tr>
<tr>
<td>Glucagon IVP.</td>
</tr>
<tr>
<td>(Toxin): Calcium Channel Blocker OD</td>
</tr>
<tr>
<td>Calcium Chloride (1g) and/or Glucagon IVP.</td>
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</tbody>
</table>
H. Symptomatic Bradycardia

Symptomatic bradycardia is defined as a heart rate less than 60/min that elicits signs and symptoms, but the heart rate will usually be less than 50/min.

STABLE - Patient is NOT hypotensive

1. Monitor Patient, treat signs and symptoms and transport.

UNSTABLE - Patient presents with CP, AMS, SOB, and/or HYPOTENSION BP < 90 mmHg

If patient is in 2nd degree type II or 3rd degree AV Block, go directly to step 3. Do not administer atropine

2. Administer Atropine, 0.5 mg IV. This may be repeated every 3-5 minutes until the maximum dose of 3 mg is reached.

3. If Atropine is unsuccessful, begin External Pacing (TCP), Procedure 23

   a) If conscious, attempt to sedate by administering Versed (midazolam), 5mg SLOW IV/IO. DO NOT delay TCP to administer Versed if the patient is profoundly unstable.

   b) Following successful electrical/mechanical capture, if BP remains < 90 mmHg give a fluid bolus up to 1000mL. Monitor B/P and lung sounds often.

   c) If BP remains < 90 mmHg administer a Dopamine infusion 10mcg/kg/minute and titrate to a blood pressure of 90-100 mmHg systolic. Appendix 9.1

4. Dopamine infusion, 10 mcg/kg/minute if TCP is unavailable or its use is unsuccessful (no capture).
Symptomatic Bradycardia

Initial Assessment Protocol 1

Assess and treat underlying causes:
Maintain Airway (Protocol 7) and administer Oxygen Procedure 1
Perform Rhythm strip and 12 lead ECG but do not delay treatment for unstable patients.

Patient Stable?

STABLE

Monitor patient and treat signs and symptoms

UNSTABLE

Atropine
0.5mg IVP
(May repeat after 3-5 Minutes)
DO NOT administer Atropine to patients with:
2° Type 2 – or - 3° AV blocks
If these rhythms are present, go to External Pacing

Atropine successful?

YES

Monitor patient and treat signs and symptoms

NO

Sedate if time allows

Pacing Procedure 23

If B/P < 90 systolic: NS Bolus
If B/P still <90 systolic: Dopamine
I. Post Resuscitation Care (ROSC)

1. Optimize ventilation and oxygenation
   
   a) Maintain oxygen saturation $\geq 94\%$ so as to avoid potential oxygen toxicity.
   
   b) Glycemic control measures should be implemented since there is an increased risk for hypoglycemia in the post-arrest phase. Measure and maintain BSL. If BSL < 100 mg/dL administer 12.5 grams (1/2 amp) of D50 IVP.

2. If blood pressure is < 90 mm Hg systolic:
   
   a) Administer a fluid bolus up to 1000mL of NS. Monitor B/P and lung sounds often it is not mandatory to administer the entire liter of fluid prior to proceeding to Dopamine. Clinical judgement should be utilized in determining when to proceed to Dopamine.

   b) Dopamine infusion at 10mcg/kg/minute and titrate to a blood pressure of 90-100 mmHg systolic. Appendix 9.1

   Post cardiac arrest patients with systolic blood pressures less than 90 mmHg are associated with higher mortality and diminished functional recovery, while systolic pressures of greater than 100 mmHg are associated with better recovery.

3. 12-lead EKG. If STEMI, treat and transport per Protocol 11 ST Elevation Myocardial Injury/STEMI.

   Patients who have achieved ROSC in the field Will be transported to the nearest STEMI facility.

Coronary angiography is reasonable in post-cardiac arrest patients for whom coronary angiography is indicated regardless of whether the patient is comatose or awake.