

Michigan
Adult Cardiac Protocols

Date: March 2011

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ASYSTOLE / PULSELESS ELECTRICAL ACTIVITY (PEA)

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Asystole / Pulseless Electrical Activity

During CPR, consider reversible causes of Asystole/PEA and treat as indicated. Causes and efforts to correct them include:

- Hypovolemia – fluid bolus
- Hypoxia – reassess airway and ventilate with high flow oxygen
- Tension pneumothorax – see **Pleural Decompression Procedure**
- Hypothermia – follow **Hypothermia Cardiac Arrest Protocol** rapid transport
- Hyperkalemia (history of renal failure) – see #6 below.

Pre-Medical Control

PARAMEDIC

1. Follow the **Cardiac Arrest - General Protocol**.
2. Confirm that patient is in asystole by evaluating more than one lead.
3. Administer Epinephrine 1:10,000, 1 mg (10 ml) IV/IO, repeat every 3-5 minutes.
4. Per MCA selection, administer Vasopressin 40 Units IV/IO in place of second dose of Epinephrine.

<u>Vasopressin</u> 40 Units IV/IO	
<input type="checkbox"/>	Included
<input checked="" type="checkbox"/>	Not Included

5. In a dialysis patient hyperkalemia is likely. Administer Calcium Chloride 1gm IV/IO and Sodium Bicarbonate 1 mEq/kg IV/IO with 20 ml NS flush in between medications.
6. Continue CPR and reassess rhythm every 2 minutes.

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BRADYCARDIA

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Bradycardia

This is a protocol for patients with serious symptomatic bradycardia. Serious symptomatic bradycardia may be defined as patients with heart rate less than 50 bpm and any of the following symptoms: chest pain, difficulty breathing, decreased level of consciousness, hypotension, or shock. Titrate treatments to a heart rate above 50 bpm. If the patient remains hypotensive, refer to the cardiogenic **Shock Protocol**.

Pre-Medical Control

MFR/EMT/SPECIALIST/PARAMEDIC

1. Follow the **General Pre-Hospital Care Protocol**.

PARAMEDIC

2. Administer Atropine 0.5 mg IV repeating every 3-5 minutes to a total dose of 3 mg IV, until a heart rate of greater than 50/minute is reached.
3. Transcutaneous pacing (TCP) when available may be initiated prior to establishment of IV access and/or before Atropine begins to take effect. Pacing is the treatment of choice for high degree A-V block. Follow the **Electrical Therapy Procedure**.
4. Per MCA selection, provide sedation as needed.

Sedation: (Select Options)
(Titrate to minimum amount necessary)

- Midazolam 1-5 mg (0.05 mg/kg) IV/ IO titrated slowly, may repeat once in 5 minutes to a maximum of 0.1 mg/kg.
- Diazepam 5-10 mg (0.1 mg/kg) IV/ IO titrated slowly, may repeat every 5 minutes to a maximum of 0.3 mg/kg.
- Lorazepam 1-2 mg (0.1 mg/kg, max 4 mg/dose) IV/ IO titrated slowly, may repeat every 5 minutes to a maximum of 8 mg.
- Fentanyl 50-100 mcg (1 mcg/kg) IV/IO titrated slowly, may repeat every 5 minutes to a maximum of 3 mcg/kg.

Post-Medical Control

1. Consider Dopamine Drip 2-10 mcg/kg/min. Mix drip by putting Dopamine 400 mg in 250 ml NS.
2. Consider Epinephrine Drip 2-10 mcg/min. Mix drip by putting Epinephrine 1:1,000, 1 mg (1 ml) in 250 ml NS.

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Notes:

1. Some patients may not tolerate the pacing stimulus to the skin and chest wall that occurs with transcutaneous pacing. In these cases, consider sedation if SBP > 100. (See box)
2. Consider possible etiologies:
 - A. Hyper/hypokalemia, other metabolic disorders
 - B. Hypothermia
 - C. Hypovolemia (including vomiting/diarrhea)
 - D. Hypoxia
 - E. Toxins/ overdose (e.g. beta-blocker or calcium channel-blocker)
 - F. Tamponade
 - G. Tension pneumothorax
3. Transcutaneous pacemaker electrode pads may be applied to these patients without initiating pacing so that the pacemaker is ready if patient condition deteriorates.
4. For symptomatic high-degree (second-degree or third-degree) AV block, begin pacing without delay.
5. Atropine should be administered by rapid IV push and may be repeated every 3-5 minutes, to a maximum dose of 3 mg. Atropine is ineffective and should be avoided in heart transplant patient.

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CARDIAC ARREST – GENERAL

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Cardiac Arrest – General

This protocol should be followed for all adult cardiac arrests.

- If an arrest is of a known traumatic origin, refer to the **Dead on Scene Protocol**.
- If it is unknown whether the arrest is traumatic or medical, continue with this protocol.
- Patients displaying a Do Not Resuscitate order or bracelet – follow **DNR Protocol**.
- When an ALS unit is present, follow this general cardiac arrest protocol in conjunction with the protocol that addresses the identified rhythm.
- Once arrest is confirmed, emphasis should be on avoiding interruptions in CPR.
- CPR should be done in accordance with current guidelines established by the American Heart Association.

Pre-Medical Control

MFR/EMT/SPECIALIST

1. Confirm Arrest
 - a. Assess for signs of normal breathing.
 - b. Check a carotid pulse for not more than 10 seconds.
2. Initiate CPR or continue CPR if already in progress and apply and use AED as soon as available.
3. Ensure CPR quality
 - a. Compressions at least 2” in depth for adults.
 - b. Compression rate at least 100 per minute.
 - c. Avoid excessive ventilation (volume and rate).
4. Continue CPR with minimal interruptions, changing the rescuer doing compressions every 2 minutes, when possible.
5. Initiate ALS response if available.
6. Establish a patent airway, maintaining C-Spine precaution if indicated, using appropriate airway adjuncts and high flow oxygen. See **Emergency Airway Procedure**.

EMT

7. If Return of Spontaneous Circulation (ROSC) has **not** been achieved after three, two minute cycles of CPR and ALS is not available or delayed, initiate transport.
8. Establish a patent airway with a supraglottic airway After insertion provide continuous CPR, without pauses for ventilation. Ventilations delivered at 8-10 breaths per minute or 1 breath every 5 to 6 seconds. See **Emergency Airway Procedure**.
9. Verify CPR quality frequently and anytime rescuer providing compressions or ventilations change.

SPECIALIST

10. If Return of Spontaneous Circulation (ROSC) has **not** been achieved after three, two minute cycles of CPR and ALS is not available or delayed, initiate transport.

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11. Start an IV/IO NS KVO. If IV is attempted and is unsuccessful after 2 attempts, start an IO line per **Vascular Access Procedure**. IO may be first line choice.
12. Establish a patent airway, maintaining C-Spine precaution if indicated, using appropriate airway adjuncts and high flow oxygen. See **Emergency Airway Procedure**.
 - a. Minimize interruptions in compressions during airway placement to less than 10 seconds.
 - b. Supraglottic airways are an acceptable alternative for endotracheal intubation.

PARAMEDIC

13. Confirm Arrest if not previously done.
 - a. Assess for signs of normal breathing.
 - b. Check a carotid pulse for not more than 10 seconds.
14. Initiate CPR, or continue CPR if already in progress and apply cardiac monitor.
15. Check rhythm, shock if indicated and continue CPR.
16. Ensure CPR quality
 - a. Compressions at least 2” in depth for adults.
 - b. Compression rate at least 100 per minute.
 - c. Avoid excessive ventilation (volume and rate).
 - d. Apply waveform capnography, if available.
17. Start an IV/IO NS KVO. If IV is attempted and is unsuccessful after 2 attempts, start an IO line per **Vascular Access Procedure**. IO may be first line choice.
18. Administer medications consistent with appropriate protocol.
19. Establish a patent airway, maintaining C-Spine precaution if indicated, using appropriate airway adjuncts and high flow oxygen. See **Emergency Airway Procedure**.
 - c. Minimize interruptions in compressions during airway placement to less than 10 seconds.
 - d. Supraglottic airways are an acceptable alternative for endotracheal intubation.
20. If quantitative waveform capnography is available and PETCO₂ is < 10 mm Hg attempt to improve CPR quality.
21. Reassess ABC’s as indicated by rhythm or patient condition change. Pulse checks should take no more than 10 seconds. If no pulse after 10 seconds, assume pulselessness, continue CPR.
22. Prior to advanced airway placement, utilize ventilation periods to visualize the EKG rhythm without compression artifact. This will allow you to plan ahead for the assessment period at the end of the two minute CPR cycle.
23. After insertion of advanced airway, monitor capnography to confirm appropriate tube placement and deliver continuous CPR, without pauses for ventilation. Ventilations delivered at 8-10 breaths per minute or 1 breath every 6 - 8 seconds.

Post-Medical Control

MFR/EMT/SPECIALIST/PARAMEDIC

24. Additional basic and/or advanced life support care as appropriate.
25. Consider termination of resuscitation per **Termination of Resuscitation Protocol**.

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CARDIAC ARREST – GENERAL

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Notes:

1. **Excellent CPR is a priority:**
 - A. 30 compressions: 2 ventilations in groups of 5 cycles, over 2 minutes.
 - B. Push hard \geq 2 inches and fast (\geq 100/min) and allow full recoil of chest during compressions.
 - C. Change rescuer doing compressions every 2 minutes to avoid fatigue or utilize automated mechanical CPR devices, if available.
 - D. Restart CPR immediately after any defibrillation attempts.
 - E. Keep pauses in CPR to a minimum by checking rhythm when rotating rescuer doing compressions and by avoiding pauses in CPR during airway management and other interventions.
2. If AED has been applied by BLS personnel, skip to appropriate place in protocol that incorporates previous care. ALS personnel should switch to manual defibrillator after initial AED shock or place AED in manual mode.
3. For Biphasic devices, shock with energy levels following manufacturers' recommendations (120 – 200 J). If unknown, use the maximum available. For monophasic devices use 360 J.
4. Confirm and document tube placement by physical exam, measurement of exhaled CO₂ and/or use of other MCA approved secondary confirmation device.
5. If possible, contact medical control prior to moving or transporting patient.
6. Continue resuscitation attempts and initiate transport, unless field termination is ordered by Medical Control.
7. An impedance threshold device may be utilized during CPR, if available. Device should be discontinued immediately upon return of spontaneous circulation.
8. Treat reversible causes.

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CARDIAC ARREST – RETURN OF SPONTANEOUS CIRCULATION (ROSC)

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Cardiac Arrest – Return of Spontaneous Circulation (ROSC)

This protocol should be followed for all adult cardiac arrests with ROSC. If arrest is of a known traumatic origin, refer to the **Trauma Protocol** and **MCA Transport Protocol**. If it is unknown whether the arrest is traumatic or medical, continue with this protocol.

Pre-Medical Control

MFR/EMT/SPECIALIST

1. If ventilation assistance is required, ventilate at 10-12 breaths per minute. Do not hyperventilate.
2. Reassess patient. If patient becomes pulseless, begin CPR and follow **Adult** or **Pediatric Cardiac Arrest General Protocol**.
3. Monitor vital signs.
4. Initiate ALS response if available.

SPECIALIST

5. Start an IV/IO NS KVO.
6. Treat hypotension (SBP less than 90 mm/Hg) with a fluid bolus consistent with **Shock Protocol**.

PARAMEDIC

7. Perform 12-lead ECG
8. Consider treatable causes
9. If ventilation assistance is required with an advanced airway in place and quantitative waveform capnography is available target PETCO₂ of 35-40 mm Hg.
10. Transport to a facility capable of Percutaneous Coronary Intervention (PCI) and therapeutic hypothermia, where available, per MCA protocol.

Post-Medical Control

PARAMEDIC

11. If hypotension persists after fluid bolus, administer Dopamine 5-20 mcg/kg/min.

Notes:

If a mechanical ventilator is available or there are spontaneous respirations in the non-intubated patient, titrate inspired oxygen on the basis of monitored oxyhemoglobin saturation to maintain a saturation of $\geq 94\%$ but $< 100\%$.

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CHEST PAIN/ACUTE CORONARY SYNDROME

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Chest Pain / Acute Coronary Syndrome

The goal is to reduce cardiac workload and to maximize myocardial oxygen delivery by reducing anxiety, appropriately oxygenating and relieving pain.

Pre-Medical Control

MFR/EMT/SPECIALIST/PARAMEDIC

1. Follow **General Pre-Hospital Care Protocol**.
2. Administer oxygen 4 L/min per nasal cannula. If evidence of respiratory distress administer oxygen per non-rebreather.

MFR

3. Assist patient in the use of their own aspirin; chew and swallow if no aspirin within 24 hours.

EMT/SPECIALIST

4. Assist patient in the use of their own aspirin, or administer up to 324 mg if available; chew and swallow if no aspirin within 24 hours.
5. Inquire of all patients (male and female) if they have taken Viagra (sildenafil citrate) or similar erectile dysfunction medications in the last 48 hours. If yes, **DO NOT ADMINISTER NITROGLYCERIN**.
6. Assist patient in the use of their own Nitroglycerin sublingual tabs (check expiration date) if available and if the patient's systolic BP is above 120 mmHg, for a maximum of 3 doses.

SPECIALIST/PARAMEDIC

7. Start an IV NS KVO. If the patient has a BP of less than 100 mmHg, administer a NS fluid bolus in 250 ml increments and reassess.

PARAMEDIC

8. Administer oxygen 4 L/min per nasal cannula; titrate to maintain SaO₂ ≥ 94%. If pulse oximetry is not available, administer oxygen at 4 L/min per nasal cannula.
9. Administer aspirin 324 mg PO; chew and swallow if no aspirin within 24 hours.
10. Obtain 12-lead ECG if available. Follow local MCA transport protocol if ECG is positive for acute ST Elevation Myocardial Infarction (STEMI) and alert the hospital as soon as possible.
11. Do not delay transport.
12. Inquire of all patients (male and female) if they have taken Viagra (sildenafil citrate) or similar erectile dysfunction medications in the last 48 hours. If yes, **DO NOT ADMINISTER NITROGLYCERIN**.
13. Administer nitroglycerin 0.4 mg sublingual if BP is above 100 mmHg. Dose may be repeated at 3 to 5 minute intervals if chest pain persists and BP remains above 100 mmHg. Nitroglycerin may be administered prior to IV placement if the BP is above 120 mmHg.
14. If pain persists after up to 3 doses of nitroglycerin, and BP is greater than 100 mmHg, administer narcotic analgesic per MCA selection.
15. Contact Medical Control.

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PAIN MEDICATION OPTION
(Choose One)

- Pre-Medical Control Order
OR
 Post-Medical Control Order

NARCOTIC ANALGESIC OPTIONS
(Select Options)

- Fentanyl 50 – 100 mcg (1 mcg/kg) IV/IO titrated slowly, may repeat ½ dose every 5 minutes to maximum of 3 mcg/kg.
- Morphine Sulfate 2 – 5 mg (0.05 mg/kg) IV/IO titrated slowly, may repeat dose every 5 minutes until maximum of 20 mg.

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PULMONARY EDEMA/CHF

Date: February 17, 2010

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Pulmonary Edema / CHF

This protocol is to be followed for patients in acute respiratory distress situations, not chronic.

Pre-Medical Control

MFR/EMT/SPECIALIST/PARAMEDIC

1. Follow **General Pre-Hospital Care Protocol**.
2. Initiate supplemental oxygen by non-rebreather mask.
3. Position patient upright with legs dependent, if possible.

PARAMEDIC

4. Consider CPAP / Bi-PAP (if available) or if indicated, an advanced airway.
5. Obtain 12-lead ECG if available. Follow local MCA transport protocol if ECG is positive for ST segment elevation myocardial infarction (STEMI) and alert hospital as soon as possible.
6. Inquire of all patients (male and female) if they have taken Viagra (sildenafil citrate) or a similar erectile dysfunction medication in the last 48 hours. If yes, **DO NOT ADMINISTER NITROGLYCERIN**.
7. If BP above 100 mmHg, administer Nitroglycerin 0.4 mg SL. Repeat every 3-5 minutes if BP above 100 mmHg. Nitroglycerin may be administered prior to IV placement if the BP is above 120 mmHg.
8. If wheezing or bronchial constriction, administer nebulized Albuterol 2.5 mg/3ml.

Post-Medical Control

Furosemide (Lasix)

40 mg IV/IO

Included

Not Included

9. Per MCA selection administer Furosemide (Lasix) 40 mg IV/IO.
10. If BP remains above 100 mmHg, consider Morphine Sulfate 2 mg IV. May be repeated once to a maximum of 4 mg.
11. If BP is less than 100 mmHg and signs/symptoms of shock, administer Dopamine 5 – 20 mcg/kg/min. Generally start at 5 mcg/kg/min, and increase every 10 minutes by an additional 5 mcg/kg/min until BP is greater than 100 mmHg. **DO NOT exceed 20 mcg/kg/min unless ordered by medical control.**

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TACHYCARDIA

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Tachycardia

This protocol is used for the care of patients with tachycardia of cardiac origin with a ventricular rate greater than 150/minute. **SYNCHRONIZED CARDIOVERSION PRECEDES DRUG THERAPY FOR UNSTABLE PATIENTS UNLESS THE RHYTHM IS IRREGULAR AND WIDE, THEN PROCEED TO DEFRIBILLATION.** Unstable patients may be defined as those suffering a tachycardia with: hypotension, acutely altered mental status, signs of shock, significant ischemic chest discomfort, shortness of breath, or pulmonary edema. Adenosine is only used for regular monomorphic rhythm tachycardia.

Pre-Medical Control

PARAMEDIC

1. Follow the **General Pre-Hospital Care Protocol**.
2. Identify and treat reversible causes.
3. Determine if patient is stable or unstable.

UNSTABLE

4. For unstable patients with a **REGULAR NARROW OR WIDE** rhythm, cardiovert beginning at 100 J, increasing to 200 J, 300 J, 360 J. (Use manufacturers suggested biphasic energy dose, 100 J).
5. For unstable patients with an **IRREGULAR NARROW** rhythm, cardiovert beginning at 200 J, increasing to 300 J, 360 J. (Use manufacturers suggested biphasic energy dose, 120 – 200 J).
6. For patients that are unstable with an **IRREGULAR WIDE** rhythm, defibrillate beginning at 200 J, increasing to 300 J, 360 J. (Use manufacturers suggested biphasic energy dose 150 – 200 J).
7. If time and condition allow prior to cardioversion, sedate per MCA selection.

Sedation: (Select Options)
(Titrate to minimum amount necessary)

- Midazolam 1-5 mg (0.05 mg/kg) IV/ IO titrated slowly, may repeat once in 5 minutes to a maximum of 0.1 mg/kg.
- Diazepam 5-10 mg (0.1 mg/kg) IV/ IO titrated slowly, may repeat every 5 minutes to a maximum of 0.3 mg/kg.
- Lorazepam 1-2 mg (0.1 mg/kg, max 4 mg/dose) IV/ IO titrated slowly, may repeat every 5 minutes to a maximum of 8 mg.
- Fentanyl 50-100 mcg (1 mcg/kg) IV/IO titrated slowly, may repeat every 5 minutes to a maximum of 3 mcg/kg.

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STABLE

8. DO NOT USE CAROTID MASSAGE. Have the patient attempt to bear down (a valsalva maneuver).
9. Start an IV NS KVO. A large bore antecubital IV should be secured whenever possible.
10. If the rhythm is regular, administer Adenosine 6 mg rapid IV push through the most proximal injection site. This should be followed immediately with 20 ml NS flush.
11. If conversion does not occur, administer Adenosine 12 mg IV using the same technique as stated above. May repeat Adenosine 12 mg dose once.
12. If rhythm is stable with narrow QRS contact medical control for possible orders.
13. If rhythm is stable with wide QRS administer Amiodarone **OR** Lidocaine per MCA Selection

<p>Medication Options (Choose One)</p> <p><input checked="" type="checkbox"/> Amiodarone - 150 mg IV over 10 minutes OR</p> <p><input type="checkbox"/> Lidocaine – 1 mg/kg IV</p>

14. If at any point a patient becomes unstable proceed to cardioversion.
15. Administer Magnesium Sulfate 2 gm IV/IO for suspected torsades de pointes.
16. Contact Medical Control

Post-Medical Control

17. Per MCA selection, administer additional Amiodarone 150 mg IV over 10 minutes as needed to a maximum of 450 mg OR Lidocaine 0.5 -1.0 mg/kg IV push every 5 - 10 minutes to a maximum of 3 mg/kg.
18. Contact Medical Control for possible orders.

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VENTRICULAR FIBRILLATION / PULSELESS VT

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Ventricular Fibrillation / Pulseless Ventricular Tachycardia

If AED is applied prior to ALS arrival, perform CPR and reassess the rhythm as indicated. After each intervention, resume CPR immediately and reassess the rhythm after each 2 minute or 5 cycle interval.

For Biphasic devices, shock with energy levels following manufacturers' recommendations (120 – 200 J). If unknown, use the maximum available. For monophasic devices use 360 J.

Pre-Medical Control

PARAMEDIC

1. Follow the **Cardiac Arrest – General Protocol**.
2. Defibrillate and then continue CPR for 2 minutes.
3. Repeat defibrillation every 2 minutes as indicated with immediate resumption of compressions. If rhythm changes, go to appropriate protocol.
4. Start an IV/IO NS KVO. If IV is unsuccessful after 2 attempts, start an IO line per **Vascular Access Procedure**. IO may be first line choice.
5. Administer Epinephrine 1:10,000, 1 mg (10 ml) IV/IO. Repeat every 3-5 minutes. May be administered before or after defibrillations.

<p><u>Vasopressin</u> 40 Units IV/IO</p> <p><input type="checkbox"/> Included <input checked="" type="checkbox"/> Not Included</p>

6. Per MCA selection, administer Vasopressin in place of the second dose of Epinephrine.
7. Establish an advanced airway. Avoid significant interruptions in CPR. See **Emergency Airway Procedure**.
8. For persistent or recurrent Ventricular Fibrillation / Pulseless Ventricular Tachycardia, administer Amiodarone 300 mg IV/IO. May be administered before or after defibrillations.
9. In a dialysis patient hyperkalemia is likely. Administer Calcium Chloride 1g IV/IO and Sodium Bicarbonate 1 mEq/kg IV/IO with 20 ml NS flush in between medications.
10. For persistent or recurrent Ventricular Fibrillation / Pulseless Ventricular Tachycardia, administer Amiodarone 150 mg IV/IO. May be administered before or after defibrillations.