



Monroe Livingston Region Program Agency

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To: All EMS Providers

From: Jeremy T. Cushman, MD, MS, EMT-P *JT Cushman*
Regional Medical Director

Date: June 30, 2011

Re: Advisory 11-10: Updated MLREMS Section 3 and 4 Protocols

At their June 20th meeting, the REMAC approved the attached protocols which incorporate the 2010 AHA updates. Section 3 – Adult Cardiac Life Support and Section 4 – Pediatric Cardiac Life Support are attached to this document and available online [here](#).

For BLS Agencies/Providers, there are no significant changes. Continuous, uninterrupted, high-quality CPR is essential to effect good outcomes.

For ALS Agencies/Providers, there are many significant changes. Attached to this advisory and available [here](#) is a summary of changes, the medication quick reference has been updated and is available online [here](#), and a brief training module on diltiazem and procainamide is available online [here](#).

These protocols are effective immediately. Agencies must update their ALS providers on these protocols no later than August 31, 2011. Once the agency has updated their personnel, the ALS provider must sign an attestation to having received the update and will abide by the entire set of Regional EMS Protocols and Policies. The attestation is available [here](#) and attached to this Advisory. Agencies must keep this attestation in the ALS provider's personnel file – do not send them to the Program Agency.

The decision to carry diltiazem or procainamide is up to the individual agency and their Medical Director. Hospital pharmacies will not restock diltiazem or procainamide. Pharmacies have been advised that vasopressin has been eliminated from the MLREMS Formulary and those quantities should be returned to the hospital from which it was received as soon as possible. Agencies may carry 200 mg of lidocaine as its use is limited to RSI pretreatment, IO placement in a conscious patient, and when amiodarone is unavailable. Agencies may also carry 2 mg of atropine as its use is limited to the bradycardic patient with a pulse.

With any questions, please do not hesitate to contact the Regional Program Agency.

Monroe-Livingston Regional EMS Protocols

Section 3

Adult Cardiac Life Support

3.0 CARDIAC ARREST – GENERAL PROCEDURES

1. Verify patient is pulseless and apneic.
2. Initiate or continue CPR. CPR is to be continued at all times as is practical.
3. Assure airway patency and begin use of BVM. Provide initial BLS airway management, including Oropharyngeal or Nasopharyngeal Airway.
4. Apply AED or SAED if available. If switching to a different AED/monitor you may use previously applied patches if compatible with new unit.
5. Follow prompts provided by AED/SAED device.
6. Utilize ALS, or initiate timely transport toward ALS (ALS intercept or hospital if closer). If ALS not available, no more than 3 shocks should be delivered at the scene. Defibrillation should not be performed in a moving ambulance.
7. Advise receiving hospital ASAP.

EMT STOP

8. If AED not already applied, defibrillate PRN after CPR of at least 5 cycles (about 2 minutes).
9. Obtain vascular access; refer to Vascular Access Protocol (2.3).
10. Secure definitive airway, refer to Airway Management Protocol (2.0). If BLS airway is sufficient to maintain chest rise, continue until additional time or resources are available. Do not interrupt compressions for placement of an advanced airway.

Remove Bag Valve device whenever transferring patient, moving patient in and out of ambulance, or other times when Bag Valve device may dislodge the device. Reassess airway patency after any movement of patient.

EMT-I STOP

11. Give medications as listed in the following specific arrhythmia / dysrhythmia protocols.

NOTE:



Should IV/IO access not be available, Epinephrine may be administered via ETT under direct, on-line Medical Control.

NOTE:

AED's and manual defibrillators may use the manufacturer's default setting for defibrillation/cardioversion. Should there not be a manufacturer recommended setting the energy setting referenced in the Standards of Care shall prevail.

3.1 VENTRICULAR FIBRILLATION & PULSELESS V-TACH

1. Follow Adult Cardiac Arrest - General Procedures Protocol (3.0)

EMT STOP EMT-I STOP

2. Defibrillate once at the manufacturers recommended energy dose

If converts to another rhythm - see appropriate protocol for that rhythm
If converts to adequate pulse - see Post Conversion Protocol (3.2)

3. Establish IV/IO access and attempt to secure airway (per protocols 2.34 and 2.0)
4. Epinephrine 1:10,000 1 mg (10mL) IV/IO

5. Defibrillate once at the manufacturers recommended energy dose

6. **If no conversion:**

Amiodarone (Cordarone) 300 mg diluted in a minimum of 20mL of normal saline IV/IO

7. Defibrillate once at the manufacturers recommended energy dose

8. **If no conversion:**

Continue defibrillations at the manufacturers recommended energy dose as long as VF or pulseless VT continues, alternating shocks with medication doses:

Repeat Epinephrine every 3-5 minutes between shocks

Repeat Amiodarone once at 150 mg diluted in a minimum of 20mL of normal saline IV/IO

If Amiodarone unavailable, may administer Lidocaine (Xylocaine) 1.5 mg/kg IV/IO push. May repeat Once.

Administer each medication during a period of 2 minutes of CPR and follow with a defibrillation attempt

9. If Torsades de Pointes or hypomagnesemic state suspected,



Magnesium Sulfate 2 gm diluted in 10mL of normal saline IV/IO push

3.2 RETURN OF SPONTANEOUS CIRCULATION

CRITERIA

- The following is for a patient with Return of Spontaneous Circulation (ROSC) as evidenced by a palpable pulse following CPR, electrical, or drug therapy for a patient previously pulseless.
- Post-conversion treatment of VF or VT should only be started if the patient has regained a pulse of adequate rate (>60). If not, refer to other cardiac protocols as appropriate.

1. Routine medical care.

EMT STOP

EMT-I STOP

2. Following ROSC, the patient should be reassessed and a complete neurologic exam, including GCS, pupillary response, and core temperature (if available) is performed.
3. Determine blood glucose and perform 12-lead EKG.

EMT-CC STOP

4. Maintain MAP >65 mmHg



Dopamine 5 mcg/kg/min to maximum 10 mcg/kg/min IV/IO titrated to maintain MAP > 65 mmHg using a rate-limiting device. Use Y-site secondary tubing for dopamine running into free-flowing normal saline primary tubing. Do not use a primary line for dopamine to prevent extravasation.

5. Determine inclusion and exclusion criteria for therapeutic hypothermia:

Inclusion: GCS \leq 8

Exclusion: Pregnancy, arrest as a result of trauma, suspected sepsis, drug intoxication, continued seizure activity, major surgery within 14 days, or temperature < 34°C (if known)

If patient meets inclusion and exclusion criteria:

Establish second, large bore, vascular access site and infuse 4°C normal saline to a total of 30 mL/kg or 2 L max (if available)

Apply ice packs to axilla, groin, and neck; change every 10-15 minutes

6. Do not delay transport to initiate therapeutic hypothermia. Transport to a facility capable of maintaining therapeutic hypothermia (Rochester General, Unity and URM-Strong), and contact Medical Control while enroute if hypothermia begun. If recurrent cardiac arrest, transfer to closest Emergency Department.

7. Prevent shivering

Midazolam (Versed) 2.5 mg IV/IO once if Systolic BP > 100 mmHg
(Additional doses per Medical Control, must contact Medical Control after use)

RSI Providers may contact Medical Control for authorization of Vecuronium 0.1 mg/kg to max of 10mg if shivering or ventilatory problems. Paralytic agents are NOT indicated unless sedation can safely be administered AND the patient has an advanced airway.

3.3 ASYSTOLE / PULSELESS ELECTRICAL ACTIVITY (PEA)

1. Follow Cardiac Arrest - General Procedures Protocol (3.0)

EMT STOP
EMT-I STOP

2. Confirm asystole in 2 leads:

If possibility of fine VF exists, treat patient as for VF, refer to VF / Pulseless VT Protocol (3.1)

3. Establish IV/IO access and attempt to secure airway (per protocols 2.34, 2.0). Do not interrupt compressions for placement of an IV/IO or an advanced airway.
4. Epinephrine 1:10,000 1 mg (10mL) IV/IO
5. Repeat Epinephrine 1:10,000 1 mg IV/IO every 3-5 minutes throughout arrest.
6. Consider and treat possible causes:
 - Hypoxia – Airway Management Protocol (2.0)
 - Hypovolemia – Fluid Challenge / Replacement Protocol (2.15)
 - Hypothermia – Hypothermia Protocol (2.19B)
 - Hyperkalemia – Consider Sodium Bicarbonate 1 mEq/kg IV once and Calcium Chloride 1 gm IV once (requires normal saline flush between medications)
 - Hydrogen ion problem (metabolic acidosis) – Consider Sodium Bicarbonate 1 mEq/kg IV once
 - Hypoglycemia – Diabetic Emergencies Protocol (2.14)
 - Tension Pneumothorax – Chest Trauma Protocol (2.11)
 - Cardiac Tamponade – Chest Trauma Protocol (2.11)
 - 'Tablets' or other poisoning / overdose – Poisoning / Overdose Protocol (2.25)
 - Thrombosis – coronary or pulmonary embolism – Timely transport
7. If no change in patient status - consider Termination of Resuscitation Protocol (1.4)

3.4 BRADYCARDIA

CRITERIA

- Bradycardia may be absolute (HR <60 bpm) or relative, which is a rate slower than expected for the patient's condition. Bradycardia may be normal status for patient on beta blockers or with an athletic life style.
- Treatment listed to be used only if one or more of these conditions exist:
 - altered mental status
 - severe chest pain
 - lightheadedness, dizziness, nausea
 - systolic BP <90 mmHg, or relative hypotension for patient
 - frequent PVCs

1. Routine medical care

EMT STOP

2. If patient is hypotensive and the lungs are clear, see Fluid Challenge / Replacement Protocol (2.15)

EMT-I STOP

If patient is in 2nd degree type II or 3rd degree AV heart block, or if patient is unstable, go to step 4.

3. Atropine 0.5 mg (5 mL) IV/IO

If Atropine is ineffective, repeat every 3 - 5 min up to 0.04 mg / kg Maximum

4. If Atropine is not effective, if patient is unstable, if patient has heart transplant or denervated heart, or if patient is in 2nd degree type II or 3rd degree AV heart block:



Transcutaneous external pacemaker, begin at 60 bpm and 60 mA and adjust to capture

If pacemaker captures, consider sedation and pain control; refer to Sedation Protocol (2.30)

EMT-CC STOP

5. If pacemaker fails to capture and Atropine is not effective, or if symptomatic hypotension continues with pacing:



Dopamine HCl 5 mcg/kg/min to Maximum 10 mcg/kg/min IV/IO titrated to maintain systolic BP > 90 mmHg using a rate-limiting device. Use Y-site secondary tubing for dopamine running into free-flowing normal saline primary tubing. Do not use a primary line for dopamine to prevent extravasation.

3.5 UNSTABLE TACHYCARDIA (WIDE OR NARROW COMPLEX)

CRITERIA

- **Stable Tachycardia** - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- **Unstable Tachycardia** - HR > 150 bpm with mental status change or evidence of shock (hypotension, poor peripheral pulses, cool distal extremities)

1. Routine medical care.

EMT STOP EMT-I STOP

2. Assess ECG rhythm, hemodynamic status, and stability of patient. If patient is in Polymorphic VT and is unstable, treat as in Pulseless Ventricular Tachycardia, refer to VF / Pulseless VT Protocol (3.1).
3. Consider sedation before cardioversion; refer to Sedation Protocol (2.30)
4. Synchronized cardioversion: 50-100 joules biphasic energy dose (100-200 joules monophasic)
5. If inadequate response from 1st cardioversion:
Synchronized cardioversion: 150 joules biphasic energy dose (300 joules monophasic)
6. If inadequate response from 2nd cardioversion:
Synchronized cardioversion: 200 joules biphasic energy dose (360 joules monophasic)
7. If inadequate response from 3rd cardioversion:



Contact Medical Control.

3.6 STABLE NARROW COMPLEX TACHYCARDIA

CRITERIA

- Supraventricular is defined as non-sinus, narrow complex tachycardia with HR usually > 150 bpm.
- If ECG complex > 0.12 seconds, refer to Wide Complex Tachycardia Protocol (3.7), especially if patient > 50 years of age, or has a history of previous MI, coronary artery disease, or CHF.
- Stable Narrow Complex Tachycardia protocol - asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- Unstable Narrow Complex Tachycardia protocol - HR >150 bpm with mental status change or evidence of shock (hypotension, poor peripheral pulses, cool distal extremities)

1. Routine medical care.

EMT STOP EMT-I STOP

2. Assess ECG rhythm, hemodynamic status, and stability of patient. Unless emergent cardioversion is indicated, obtain 12 lead ECG prior to any rhythm management:

- **If unstable, refer to UNSTABLE TACHYCARDIA Protocol (3.5)**
- If supraventricular tachycardia, go to Step 3
- If atrial flutter or atrial fibrillation, go to Step 6

3. Valsalva or other vagal maneuver. (No eyeball pressure/massage).

4. If inadequate response from vagal maneuver:

Adenosine (Adenocard) 6 mg rapid IV push with 10mL rapid saline flush

5. If inadequate response from 1st dose within 2 minutes:

Adenosine 12 mg rapid IV push with 10mL rapid saline flush, May repeat x1

(If inadequate response from Adenosine in narrow complex tachycardia with signs of CHF, go to step 7.)

EMT-CC STOP

6. If atrial flutter / atrial fibrillation *OR* if inadequate response from Adenosine in narrow complex tachycardia with no signs of CHF:

Metoprolol 5 mg slow IV push, may repeat every 5 minutes to Max 15 mg or HR < 120 bpm

OR

Diltiazem (if available) 0.25 mg/kg (max 15 mg per dose) slow IV, May repeat once at 0.35 mg/kg (max 15 mg per dose).

7. If patient unresponsive to previous interventions or if patient has signs of CHF:

Procainamide (if available) 20 mg/min until:

Maximum dose of 17mg/kg or 1 gram is reached

Hypotension occurs

QRS widens by 50% of original width

Rhythm converts

To administer: Dilute 1000mg/2mL vial in 100mL (concentration 10 mg/mL); Administer 2 mL/min

OR

Amiodarone (Cordarone) 150 mg diluted in a minimum of 50mL of NS given IV over 10 minutes

NOTE

**If patient becomes UNSTABLE (See criterion above), refer to Unstable Tachycardia Protocol (3.5).
If patient has a recent history of cocaine use, do not use Metoprolol.**

3.7 STABLE WIDE COMPLEX TACHYCARDIA

CRITERIA

- If patient has wide complex tachycardia and is pulseless, refer to VF/ Pulseless VT Protocol (3.1)
- Stable VT protocol - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- Unstable VT protocol – HR >150 bpm with altered mental status changes or evidence of shock (hypotension, poor peripheral pulses, cool distal extremities).

1. Routine medical care.

EMT STOP

EMT-I STOP

EMT-CC STOP

2. Assess hemodynamic status & stability of patient - **If unstable; refer to UNSTABLE TACHYCARDIA Protocol (3.5)**. Unless emergent cardioversion, obtain 12 lead ECG prior to any rhythm management.

3. Establish Vascular Access per Vascular Access Protocol (2.34).

4. If monomorphic VT or non-Torsades polymorphic VT (normal baseline QT interval), or Wolff-Parkinson-White with aberrancy:

Procainamide (if available) 20 mg/min until:

Maximum dose of 17mg/kg or 1 gram is reached

Hypotension occurs

QRS widens by 50% of original width

Rhythm converts

To administer: Dilute 1000mg/2mL vial in 100mL (concentration 10 mg/mL); Administer 2 mL/min

OR

Amiodarone (Cordarone) 150 mg diluted in a minimum of 50mL NS and given IV over 10 minutes

5. If polymorphic VT (long baseline QT interval):

Magnesium Sulfate 2gm in 100 mL NS given over 10 min – contraindicated if the patient has suspected renal failure

6. If undifferentiated wide complex tachycardia:

Adenosine (Adenocard) 6 mg rapid IV push with 10mL rapid saline flush



If inadequate response from 1st dose within 2 minutes:

Adenosine 12 mg rapid IV push with 10mL rapid saline flush, May repeat x1

NOTE:

If patient becomes UNSTABLE (See criterion above), refer to Unstable Tachycardia Protocol (3.5).

Monroe-Livingston Regional EMS Protocols

Section 4

Pediatric Cardiac Life Support

4.0 PEDIATRIC CARDIAC ARREST – GENERAL PROCEDURES



1. Verify patient is pulseless and apneic.
2. Initiate or continue CPR. CPR is to be continued at all times as is practical.
3. Assure airway patency and begin use of BVM. Provide initial BLS airway management, including Oropharyngeal or Nasopharyngeal Airway.
4. Apply AED or SAED if available. If switching to a different AED/monitor you may use previously applied patches if compatible with new unit.

If patient \geq age 8 - automatic external defibrillator may be used as appropriate.

If patient $<$ age 8 - Use pediatric cables if available.

5. Follow prompts provided by AED/SAED device.
6. Utilize ALS, or initiate timely transport toward ALS (ALS intercept or hospital if closer). If ALS not available, no more than 3 shocks should be delivered at the scene. Defibrillation should not be performed in a moving ambulance.

EMT STOP

7. Obtain Vascular access, refer to Vascular Access Protocol (2.34)

EMT-I STOP

8. If AED /SAED not already applied quick look using manual monitor and defibrillate PRN after CPR of at least 10 cycles (about 2 minutes). Apply limb leads and pads in between shock sequences as appropriate.
9. Secure definitive airway (per protocol 2.1). If BLS airway is sufficient to maintain chest rise, continue until additional time or resources are available. Do not interrupt compressions for placement of an advanced airway.

Remove Bag Valve device whenever transferring patient, moving patient in and out of ambulance or other times when Bag Valve device may dislodge the device. Reassess airway patency after any movement of patient.

10. Give medications as listed in the following specific arrhythmia / dysrhythmia protocols.

NOTE:



Should IV/IO access not be available, Epinephrine may be administered via ETT with direct on-line medical control.

4.1 VENTRICULAR FIBRILLATION / PULSELESS V-TACH



1. Follow Pediatric Cardiac Arrest, see General Procedures Protocol (4.0)

EMT STOP EMT-I STOP

2. Defibrillate once at 2 J/kg energy dose (Max 100 joules biphasic, 200 joules monophasic)


If converts to another rhythm – refer to appropriate protocol for that rhythm
If converts to adequate pulse – refer to Post Conversion Protocol (4.2).

3. Defibrillate once at 4 J/kg dose (Max 200 joules biphasic, 360 joules monophasic)
4. Establish IV/IO access and attempt to secure airway (per protocols 2.34 and 2.1).
5. Epinephrine 1:10,000 0.01 mg/kg (0.1mL/kg, Max 1mg) IV/IO
6. Defibrillate once at 4 J/kg (Max 200 joules biphasic, 360 joules monophasic)

7. **If no conversion:**



Amiodarone (Cordarone) 5 mg/kg diluted in a minimum of 20mL NS and given IV/IO push (Max 300mg)

8.  Defibrillate once at 4 J/kg (Max 200 joules biphasic, 360 joules monophasic)

9.  **If no conversion:**

Continue defibrillations at 4 J/kg (Max 200 joules biphasic, 360 joules monophasic) as long as VF or pulseless VT continues, alternating shocks with medication doses:

Repeat Epinephrine every 3-5 minutes between shocks

Repeat Amiodarone (Cordarone) 5 mg/kg diluted in a minimum of 20mL NS and given IV/IO push, once (Max 150 mg)

If Amiodarone unavailable, may administer Lidocaine (Xylocaine) 1.5 mg/kg IV/IO push. May repeat Once

Deliver each medication administration during a period of 2 minutes of CPR and coordinate with a defibrillation attempt

EMT-CC STOP

10. If Torsades de Pointes or hypomagnesemic state suspected consider

Magnesium Sulfate 50 mg/kg diluted in a minimum of 10mL NS and given IV/IO push (Max 2 gm)

NOTE: If using the maximal weight-based energy setting it is appropriate to use the manufacturers recommended energy dose for an adult.



4.2 RETURN OF SPONTANEOUS CIRCULATION

CRITERIA

The following is for a patient with Return of Spontaneous Circulation (ROSC) as evidenced by a palpable pulse following CPR, electrical, or drug therapy for a patient previously pulseless.

- Post-conversion treatment of VF or VT should only be started if the patient has regained a pulse of adequate rate (>60). If not, refer to other cardiac protocols as appropriate.

1. Routine medical care.

EMT STOP

EMT-I STOP

2. Following ROSC, the patient should be reassessed and a 12 lead ECG and blood glucose should be performed.
3. Perform complete neurologic exam, including GCS and pupillary response.

EMT-CC STOP

4. Maintain MAP >65 mmHg



Dopamine 5 mcg/kg/min to maximum 10 mcg/kg/min IV/IO titrated to maintain MAP > 65 mmHg using a rate-limiting device. Use Y-site secondary tubing for dopamine running into free-flowing normal saline primary tubing. Do not use a primary line for dopamine to prevent extravasation.

4.3 ASYSTOLE / PULSELESS ELECTRICAL ACTIVITY (PEA)



1. Follow General Procedures Protocol (4.0)

EMT STOP EMT-I STOP

2. Confirm asystole in 2 leads:
If possibility of fine VF exists, treat patient as for VF, refer to VF / Pulseless VT Protocol (4.1)
3. Establish IV/IO access and attempt to secure airway (per protocols 2.34 and 2.1). Do not interrupt compressions for placement of an IV/IO or an advanced airway.
4. Epinephrine: 1:10,000 0.01 mg/kg (0.1 mL/kg) (Max dose 1mg) IV/IO
5. Repeat Epinephrine every 3-5 minutes throughout arrest using above dose
6. Consider and treat cause
 - Hypoxia – Airway Management Protocol (2.1)
 - Hypovolemia – Fluid Challenge / Replacement Protocol (2.15)
 - Hypothermia – Hypothermia Protocol (2.19B)
 - Hyperkalemia – Consider Sodium Bicarbonate 1 mEq/kg IV once and Calcium Chloride 5 mg/kg (Max dose 1gm) IV once (requires normal saline flush between medications)
 - Hydrogen ion problem (metabolic acidosis) – Consider Sodium Bicarbonate 1 mEq/kg IV once
 - Hypoglycemia – Diabetic Emergencies Protocol (2.14)
 - Tension pneumothorax – Chest Trauma Protocol (2.11)
 - Cardiac Tamponade – Chest Trauma Protocol (2.11)
 - 'Tablets' or other poisoning / overdose – Poisoning / Overdose Protocol (2.25)
 - Thrombosis – coronary or pulmonary embolism – Timely transport

4.4 BRADYCARDIA



CRITERIA

- Bradycardia may be absolute or relative, which is a rate slower than expected for the patient's condition and is almost always the result of hypoxia in children.
 - Treatment listed to be used only if one or more of these conditions exist:
 - altered mental status
 - severe chest pain
 - lightheadedness, dizziness, nausea
 - systolic BP <80 mmHg, or relative hypotension for patient's expected normal
 - frequent PVCs
1. Routine medical care and begin timely transport. For newborns, refer to Neonatal Resuscitation Protocol (2.22).
 2. Assure airway patency and administer high flow oxygen. Bag-valve mask assisted ventilation should always be done for children < 8 yrs of age with bradycardia with poor perfusion.
 3. Administer chest compressions if, despite ventilation and oxygenation, pulse remains < 60 bpm with poor perfusion.

EMT STOP EMT-I STOP

4. If evidence of poor perfusion potentially due to hypovolemia with no signs or history of heart disease, see Fluid Challenge / Replacement Protocol (2.15)
5. If continued pulse < 60 bpm and evidence of poor perfusion despite assurance of adequate ventilation / oxygenation:



Epinephrine: 1:10,000 0.01 mg/kg (0.1 mL/kg), (Max dose 1mg) IV/IO

EMT-CC STOP

6. If continued pulse < 60 bpm and evidence of poor perfusion after Epinephrine despite assurance of adequate ventilation / oxygenation:


Atropine 0.02 mg/kg IV/IO (Min 0.1 mg, Max 1mg)

7. If inadequate response:

Epinephrine at above doses IV/IO every 3-5 minutes

8. If inadequate response:

Atropine once 5 minutes after initial dose:
0.02 mg/kg IV/IO (Min 0.1 mg, Max 1mg)
Maximum total Atropine dose – 0.04 mg/kg

9.  If inadequate response, consider Pacing.

4.5 UNSTABLE TACHYCARDIA (WIDE OR NARROW COMPLEX)



CRITERIA

- **Stable Tachycardia** - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- **Unstable Tachycardia** - HR > 150 bpm with mental status change, or evidence of shock (hypotension, poor peripheral pulses, cool distal extremities)

1. Routine medical care.
2. Assure airway patency and administer high flow oxygen.
3. Timely transport.

EMT STOP

EMT-I STOP

EMT-CC STOP

4. Consider sedation; refer to Sedation Protocol (2.30)
5. Synchronized cardioversion 0.5 j/kg biphasic energy dose (Max 50j; 1 j/kg monophasic, Max 200j)

Consider the use of pediatric paddles if patient \leq 10kg, or use anterior-posterior placement of paddles if body area is small (or when pediatric paddles are not available).

6. If inadequate response from 1st cardioversion:



Synchronized cardioversion: 1 j/kg biphasic energy dose (Max 100j; 2 j/kg monophasic, Max 300j)

7. If inadequate response from 2nd cardioversion:



Synchronized cardioversion: 2 j/kg biphasic energy dose (Max 200j; 4 j/kg monophasic, Max 360j)

8. If inadequate response from 3rd cardioversion:



Contact Medical Control

4.6 STABLE NARROW COMPLEX TACHYCARDIA



CRITERIA

- Supraventricular is defined as non-sinus, narrow complex tachycardia with HR usually > 160 bpm. If ECG complex > 0.12 seconds, refer to Wide Complex Tachycardia Protocol (4.7)
- Stable Narrow Complex Tachycardia protocol - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- Unstable Narrow Complex Tachycardia protocol - HR > 150 bpm with mental status change, or shock symptoms (hypotension, poor peripheral pulses, cool distal extremities)

1. Routine medical care.
2. Assure airway patency and administer high flow oxygen.
3. Timely transport.

EMT STOP EMT-I STOP

4. Assess hemodynamic status & stability of patient - **If unstable; refer to UNSTABLE TACHYCARDIA Protocol (4.5).**
5. Valsalva maneuver (application of ice water bag over the face (do not block the airway), 'blowing on thumb' or into straw may work on child)
6. Establish vascular access, refer to Vascular Access Protocol (2.34)

EMT-CC STOP

7. If inadequate response from Valsalva:



Adenosine (Adenocard) 0.1 mg/kg rapid IV push (Max 6 mg) with 5mL rapid saline flush

8. If inadequate response from Adenosine:

Repeat Adenosine 0.2 mg/kg rapid IV push (Max 12 mg) with 5mL rapid saline flush, may repeat once

9. If inadequate response from 3rd dose of Adenosine:

Refer to Stable Wide Complex Tachycardia Protocol (4.7).

NOTE:

If no response to above and patient becomes UNSTABLE, refer to Unstable Tachycardia Protocol (4.5).

4.7 STABLE WIDE COMPLEX TACHYCARDIA



CRITERIA

- If patient has wide complex tachycardia and is pulseless, refer to VF / Pulseless VT Protocol (4.1)
- Stable VT protocol - Asymptomatic or minor symptoms (palpitations, heart racing, etc.)
- Unstable VT protocol – HR >150 bpm with altered mental status change or shock symptoms (hypotension, poor peripheral pulses, cool distal extremities).

1. Routine medical care.
2. Assure airway patency and administer high flow oxygen.

EMT STOP

EMT-I STOP

EMT-CC STOP

3. Assess hemodynamic status & stability of patient - **If unstable; refer to UNSTABLE TACHYCARDIA Protocol (4.5)**
4. Establish vascular access; refer to Vascular Access Protocol (2.34).

Procainamide (if available) 20 mg/min until:

Maximum dose of 17mg/kg or 1 gram is reached

Hypotension occurs

QRS widens by 50% of original width

Rhythm converts

To administer: Dilute 1000mg/2mL vial in 100mL (concentration 10 mg/mL); Administer 2 mL/min



OR



Amiodarone (Cordarone) 5mg/kg diluted in a minimum of 50 mL NS IV/IO given over 20 min, (Max 150 mg)

If undifferentiated wide complex tachycardia:

Adenosine (Adenocard) 0.1 mg/kg rapid IV push (Max 6 mg) rapid IV push with 5 mL rapid saline flush.



If inadequate response from 1st dose within 2 minutes:

Adenosine 0.2 mg/kg rapid IV push (Max 12 mg) with 5mL rapid saline flush, May repeat x1

NOTE:

If no response to above or if patient becomes UNSTABLE, refer to Unstable Tachycardia Protocol (4.5)

MLREMS 2011 Protocol Update

Summary of Changes

The following provides a brief overview of the major changes to the MLREMS Protocols. Please review the new protocols in their entirety.

For BLS providers, there are no significant changes. Uninterrupted, high quality CPR is essential to maximize outcome.

For ALS providers that are many, significant changes. Please review carefully.

Section 3 – Adult Cardiac Life Support

3.0 – Emphasis on uninterrupted CPR at the BLS and ALS levels. Do not interrupt compressions for placement of an advanced airway (endotracheal tube or King).

3.0 – Only epinephrine may be given via ETT by Medical Control Order (generally discouraged as IV/IO access is preferred).

3.1/3.2 – Vasopressin has been removed from the protocols entirely and has been removed from the prehospital formulary. It offers little benefit and only increases the number of patients with a poor neurologic outcome.

3.1 – Defibrillation energy has been changed to “manufacturer’s recommended energy dose” as there is significant variation in delivered energy based on different propriety software/hardware. In the end, all current manufacturers adhere to the AHA recommendations.

3.1 – Amiodarone remains the first line drug for pulseless VT/VF after defibrillation and epinephrine. Lidocaine should only be given if amiodarone is unavailable. If the VT/VF does not terminate after a total of 350 of amiodarone, epinephrine, and repeated shocks, contact medical control. In general there is no benefit of adding lidocaine in addition to amiodarone. Agencies may consider carrying smaller quantities of lidocaine as its use for cardiac disease is limited to when amiodarone is unavailable and its only other use in the formulary is for pre-treatment for RSI and IO placement in a conscious patient.

3.2 – For Return of Spontaneous Circulation, NO post-conversion antiarrhythmics are indicated. This is a major change but supported in the literature and by our cardiac centers in the region. This simplifies the ROSC protocol such that if you achieve ROSC, obtain a BG and 12-lead, concentrate on maintaining adequate blood pressure, and determine eligibility and implement therapeutic hypothermia.

3.3 – Atropine has been removed for treatment of PEA/Asystole. There is no indication for pacing bradysystolic arrests. Do not interrupt compressions for placing an IV/IO or an advanced airway (ETT or King). For suspected hyperkalemia, administer 1 gram of calcium chloride (increased from 200 mg).

3.5/3.6 – “Unstable” tachycardia is defined as mental status change or evidence of shock (hypotension, poor peripheral pulses, or cool distal extremities). Presence of chest pain, CHF, or diaphoresis in and of itself is not considered “unstable”.

3.6 – For paramedics only, diltiazem (Cardizem) has been added back to the formulary for treatment of atrial flutter/fibrillation. Hospitals will not provide restock. Decision to carry diltiazem is an agency decision in consultation with their medical director. Dose is 0.25 mg/kg to a max of 15 mg per dose SLOW IV. May repeat once at 0.35 mg/kg (again max of 15 mg per dose). Please refer to the separate diltiazem training materials to refresh your knowledge of the medication.

3.6/3.7 – For paramedics only, procainamide has been added to the formulary for treatment of atrial flutter/fibrillation unconverted by metoprolol or diltiazem and has been added for treatment of stable wide complex tachycardia. Hospitals will not provide restock. Decision to carry procainamide is an agency decision in consultation with their medical director. Dose is 20 mg/min until the maximum dose of 17 mg/kg or 1 gram is reached, hypotension occurs, the QRS widens by 50% of original width, or the rhythm converts. DO NOT BOLUS PROCAINAMIDE. Please refer to the separate procainamide training materials to refresh your knowledge of the medication.

3.7 – For paramedics, adenosine is an option for undifferentiated wide complex tachycardia with medical control order. Caution is advised because VT can be converted with adenosine so conversion means nothing as to the “real” underlying rhythm.

Section 4 – Pediatric Cardiac Life Support

4.0 – Emphasis on uninterrupted CPR at the BLS and ALS levels. Do not interrupt compressions for placement of an advanced airway (endotracheal tube or King).

4.0 – Only epinephrine may be given via ETT by Medical Control Order (generally discouraged as IV/IO access is preferred).

4.0/4.1 – The lower age limit for defibrillation has been removed. Any pediatric patient may be defibrillated with preference for pediatric pads. The pads should not touch, and if the patient’s torso is too small, consider antero-posterior pad placement rather than shoulder/apex.

4.1 – Amiodarone remains the first line drug for pulseless VT/VF after defibrillation and epinephrine. Lidocaine should only be given if amiodarone is unavailable. If the VT/VF does not terminate after a total of 350 of amiodarone, epinephrine, and repeated shocks, contact medical control. In general there is no benefit of adding lidocaine in addition to amiodarone. Agencies may consider carrying smaller quantities of lidocaine as its use for cardiac disease is limited to when amiodarone is unavailable and its only other use in the formulary is for pre-treatment for RSI and IO placement in a conscious patient.

4.2 – For Return of Spontaneous Circulation, NO post-conversion antiarrhythmics are indicated. This is a major change but supported in the literature and by our cardiac centers in the region. This simplifies the ROSC protocol such that if you achieve ROSC, obtain a BG and 12-lead and concentrate on maintaining adequate blood pressure. At this time, pediatric patients are not eligible for therapeutic hypothermia.

4.3 – There is no indication for pacing bradysystolic arrests. Do not interrupt compressions for placing an IV/IO or an advanced airway (ETT or King). For suspected hyperkalemia, administer 5 mg/kg up to a max of 1 gram of calcium chloride (increased from 200 mg).

4.5/4.6 – “Unstable” tachycardia is defined as mental status change or evidence of shock (hypotension, poor peripheral pulses, or cool distal extremities). Presence of chest pain, CHF, or diaphoresis in and of itself is not considered “unstable”.

4.7 – For paramedics only with on-line medical direction, procainamide has been added to the formulary for treatment of stable wide complex tachycardia. Hospitals will not provide restock. Decision to carry procainamide is an agency decision in consultation with their medical director. Dose is 20 mg/min until the maximum dose of 17 mg/kg or 1 gram is reached, hypotension occurs, the QRS widens by 50% of original width, or the rhythm converts. DO NOT BOLUS PROCAINAMIDE. Please refer to the separate procainamide training materials to refresh your knowledge of the medication.

4.7 – For paramedics only with on-line medical direction, adenosine is an option for undifferentiated wide complex tachycardia with medical control order. Caution is advised because VT can be converted with adenosine so conversion means nothing as to the “real” underlying rhythm.

This ends the 2011 Protocol Update Summary

V 2.3 6/28/11 JT Cushman

Monroe-Livingston Regional EMS Standards of Care Medication Dosage Sheet

Protocol	Medication	Adult	Pediatric	Notes
2.5 Allergic Reaction Anaphylaxis	Epi 1:1,000 (EpiPen)	0.3 mg IM	0.15 mg IM (<30kgs)	
	Diphenhydramine	50 mg IV/IO	2 mg/kg IV/IO (Max 25 mg)	IM ok if no IV/IO
	Epi 1:1,000	0.3 mg IM	0.01 mg/kg IM (Max 0.3 mg)	May repeat q 5 min, NEVER give IV/IO
	Albuterol & Ipratropium	5 mg & 0.5 mg nebs	2.5 mg & 0.5 mg nebs (dilute to 5 ml)	
	Epi 1:10,000	0.5 mg Slow IV/IO	0.01 mg/kg Slow IV/IO (Max 0.3 mg)	Only used in profound shock and poor perfusion
	Glucagon	1 mg IV/IO		If patient is on a beta-blocker and non-responsive to epi
2.8 Behavioral Emergencies	Midazolam	up to 2.5 mg IV/IM		Must contact medical control after use, add'l doses absolute online
2.10 Chest Pain	Asprin	324 mg PO		
	Nitroglycerin	0.4 mg SL		every 3-5 min prn, if SBP > 90 mmHg; HR>50<130
	RV Failure Fluid Challenge	500 ml NS IV/IO		
	Dopamine	5 to 10 mcg/kg/min IV		Titrate to SBP > 90 mmHg with Medical Control
Refractory pain	Morphine	5 mg slow IV/IO		With Medical Control
2.13 Croup	Epi 1:1,000		age <1 0.5mL/kg max 2.5mL age 1-4 2.5mL age ≥5 5mL	With Medical Control for all ages Mix with 3mL Normal Saline for all ages
2.14 Diabetic BG > 300mg/dl Diabetic BG < 80mg/dl	Fluid Challenge	500 ml NS IV/IO		
	D50	12.5-25 gm IV/IO	0.5-1 gm/kg IV/IO (Use for Peds > 5kg)	Repeat as needed
	D25		0.5-1 gm/kg IV/IO (Use for Peds <5 kg)	Repeat as needed
	Glucagon	1 mg IM	0.1 mg/kg IM (Max 1 mg)	
2.15 Fluid Challenge	0.9% Saline	500 ml NS IV/IO	20 ml/kg IV/IO (Max 500 ml)	With Medical Control for Dialysis patients
2.18 Hypotension/Shock	Fluid Challenge	500 ml NS IV/IO		
	Dopamine	5 to 10 mcg/kg/min IV		Titrate to SBP > 90 mmHg with Medical Control
2.20 Nausea/Vomiting	Promethazine	6.25 mg to 12.5 mg IV		Dilute in 50 mL NS over 10 min
	Dystonic Rxn Diphenhydramine	25 mg IM/IV		May repeat x1
2.22 Neonatal Resuscitation	Epi 1:10,000		0.01 mg/kg IV/IO (0.1 ml/kg) (Max 1 mg)	Repeat q 5 min with Medical Control
	Naloxone		Consider 0.1 mg/kg IV/IO (Max 2 mg)	
	0.9% Saline		Consider 20 ml/kg IV/IO	
2.24 Pain Management	Morphine	5 mg IM, slow IV/IO	0.1 mg/kg Im, slow IV/IO (Max 5 mg)	Repeat dose with Med Ctrl; Absolute -0.1 mg/kg (max 5 mg peds) every 10 min
2.25 Poisoning/Overdose	Activated Charcoal	50 gm PO	2 gm/kg (Max 50 gm)	With Medical Control
	Opiate w/ resp dep Naloxone	0.4 mg IV/IM/IO OR	0.1 mg/kg (Max 0.4 mg)	May repeat to support respiratory efforts
	Naloxone	0.8 mg via MAD		
	Poss Ca+ Channel 10 % Calcium Chloride	1000 mg slow IV/IO	Contact medical control	With Medical Control
	Poss TCA or ASA Sodium BiCarb	100 mEq Slow IV/IO	Contact medical control	With Medical Control
	Poss Beta Blocker Glucagon	2 mg IV/IO/IM	0.1 mg/kg (Max 2 mg)	
2.26 Pulmonary Edema/ CHF Systolic SBP< 90mmHg	Nitroglycerin	0.4 mg SL		Repeat q 3-5 min if SBP > 90 mmHg
	Dopamine	5 to 10 mcg/kg/min IV		Physician Consult
2.27 RSI Pretreatment	Atropine	0.5 mg IV/IO		For symptomatic bradycardia
	Lidocaine	1.5 mg/kg IV/IO		For suspected elevated intracranial pressure
	Sedation Etomidate	0.3 mg/kg IV/IO		
	Paralytics Succinylcholine	1.5 mg/kg IV/IO		A second dose of 0.5 mg/kg may be given if 1st dose ineffective
	Post RSI-sedation Midazolam	2.5 mg IV/IO		With caution SBP <90, Repeat doses with Medical Control
	Post RSI-analgesia Morphine	5 mg slow IV/IO		With caution SBP <90, Repeat doses with Medical Control
	Post RSI-paralysis Vecuronium	0.1 mg/kg IV		Absolute Online & Pt must have received sedation and analgesia
2.29 Resp Distress/Bronchospasm	Albuterol	5 mg neb	2.5 mg neb	May repeat up to a total of 30 mg/hr
	Ipratropium Bromide	0.5 mg neb	0.5 mg neb	May mix with albuterol and give simultaneously
	Epi 1:1,000	0.3 mg IM	0.01 mg/kg IM (Max 0.3 mg)	With Medical Control, May repeat up to 2 times q 15 min
	Magnesium Sulfate	2 gm IV	50 mg/kg IV (Max 2 gm)	With Medical Control, Dilute in 100 ml NS over 10 min

Monroe-Livingston Regional EMS Standards of Care Medication Dosage Sheet

Protocol	Medication	Adult	Pediatric	Notes	
2.30	Sedation Cardioversion	Morphine AND	5 mg slow IV/IO	<i>0.1 mg/kg slow IV (Max 5 mg)</i>	Must contact med control after use, add'l doses with Medical Control
		Midazolam OR	2.5 mg IV/IO	<i>0.05 mg/kg (Max 2.5 mg)</i>	Must contact med control after use, add'l doses with Medical Control
		Etomidate	0.1 mg/kg IV/IO		RSI parametic only, must contact medical control after use
	Transcutaneous Pacing	Morphine AND	5 mg slow IV/IO		Must contact med control after use, add'l doses with Medical Control
		Midazolam	2.5 mg IV/IO		Must contact med control after use, add'l doses with Medical Control
	Post-intubation	Morphine AND	5 mg slow IV/IO		Must contact med control after use, add'l doses with Medical Control
Midazolam		2.5 mg IV/IO		Must contact med control after use, add'l doses with Medical Control	
2.31	Seizure	Midazolam	2.5 mg IV/IO/IM	<i>0.05 mg/kg IV/IO/IM (Max 2.5 mg)</i>	Must contact med control after use, add'l doses with Medical Control
	Eclampsia	Magnesium Sulfate	5 gm IV/IO		Dilute in 100mL over 5 minutes, Additional 2gm-Absolute Online
2.34	Vascular Access	Lidocaine	30 mg (1.5 ml) Slow IO	<i>30 mg (1.5 ml) Slow IO</i>	Prior to infusing NS or meds
3.1, 4.1	V-Fib/Pulseless VT	Epi 1:10,000	1 mg IV/IO	<i>0.01 mg/kg IV/IO (Max 1 mg)</i>	Repeat q 3-5 min
		Amiodarone	300 mg slow IV/IO	<i>5 mg/kg slow IV/IO (Max 300 mg)</i>	Dilute in min 20 mL NS, may repeat-(Adult)-150mg, (Peds)-5 mg/kg (max 150mg)
	Only if no amio	Lidocaine	1.5 mg/kg IV/IO	<i>1 mg/kg IV/IO</i>	May repeat-(Adult)-0.75 mg/kg, (Peds)-1 mg/kg
	Torsades de Pointes	Magnesium Sulfate	2 gm IV/IO	<i>50 mg/kg slow IV/IO</i>	Dilute in 10 mL of NS
3.2, 4.2	Post-Conv	No antiarrhythmics			
	Systolic SBP< 90mmHg	Dopamine	5 to 10 mcg/kg/min IV	<i>5 to 10 mcg/kg/min</i>	Physician Consult
3.3, 4.3	Asystole/ PEA	Epi 1:10,000	1 mg IV/IO	<i>0.01 mg/kg IV/IO (Max 1 mg)</i>	Repeat q 3-5 min
	Hyperkalemia	Sodium BiCarb AND	1 mEq/kg IV/IO	<i>1 mEq/kg IV/IO</i>	
		10% Calcium Chloride	1000 mg IV/IO	<i>5 mg/kg IV/IO</i>	
	Metabolic Acidosis	Sodium BiCarb	1 mEq/kg IV/IO	<i>1 mEq/kg IV/IO</i>	
3.4, 4.4	Bradycardia Hypotensive	Fluid Challenge	500 ml NS IV/IO	<i>20 mg./kg NS IV/IO</i>	
		Atropine	0.5 mg IV/IO	<i>0.02 mg/kg IV/IO (Min 0.1 mg, Max 1 mg)</i>	Repeat q 3-5 min (Max 0.04 mg/kg total)
	Dopamine	5-10 mcg/kg/min		With med control, titrate to SBP >90 mmHg	
	Epinephrine 1:10,000		<i>0.01 mg/kg IV/IO (Max 1 mg)</i>	Repeat q 3-5 min	
3.6, 4.6	Stable Narrow Complex Tachy	Adenosine	6 mg rapid IV	<i>0.1 mg/kg rapid IV (Max 6mg), must call med control</i>	May repeat q5 (Adult) 12 mg x 2; (Peds) 0.2 mg/kg x 2
		Metoprolol	5 mg slow IV		May repeat q 5 min, (Max 15 mg or HR < 120 bpm)
		Diltiazem	0.25 mg/kg IV/IO		Max 15 mg, may repeat at 0.35 mg/kg max 15 mg
	Signs of CHF	Procainamide	20 mg/min IV/IO		Stop if max 17mg/kg or 1 gm; hypotension, QRS widens, or rhythm converts
		Amiodarone	150 mg IV /IO		Dilute in min 50 mL of NS over 10 minutes
3.7	Stable WCT Monomorphic VT	Amiodarone	150 mg IV/IO	<i>5 mg/kg slow IV/IO (Max 150 mg) with med control</i>	Dilute in min 50 mL of NS over 10 minutes (Adult), over 20 min (Peds)
		Procainamide	20 mg/min IV/IO	<i>20mg/min IV/IO</i>	Stop if max 17mg/kg or 1 gm; hypotension, QRS widens, or rhythm converts
	Polymorphic VT	Adenosine	6 mg rapid IV	<i>0.1 mg/kg rapid IV (Max 6mg), must call med control</i>	May repeat q5 (Adult) 12 mg x 2; (Peds) 0.2 mg/kg x 2
		Magnesium Sulfate	2 gm IV/IO		Dilute in 100 mL of NS over 10 minutes, contra-ind-Renal Failure

MLREMS Primer on Diltiazem and Procainamide

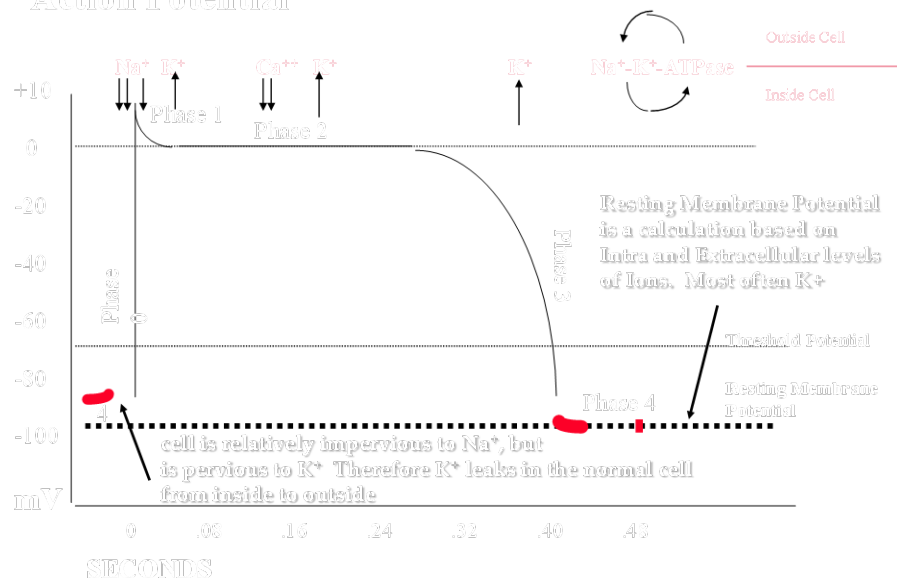
Consider causes of arrhythmia such as enhanced automaticity, reentry, conduction disturbances. Then consider the reversible precipitating factors that if managed could result in rhythm improvement such as hypoxia, electrolyte imbalance, acid-base disturbance, ischemia, altered sympathetic tone or drug toxicity. If possible treat those underlying factors prior to administering antiarrhythmics.

Recall your cardiac electrophysiology training. All heart cells are electrically active:

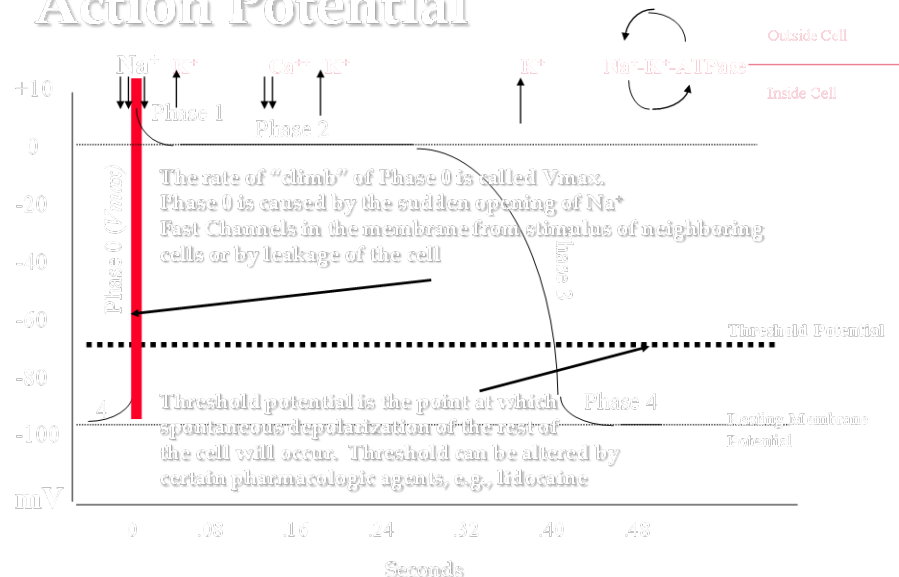
- non-pacemaker cells must be driven past threshold
- pacemaker cells leak spontaneously past threshold
- non-pacemaker cells 'rest' in between depolarizations
- pacemaker cells do not 'rest', they spontaneously depolarize through Ca^{++} channel influx

Consider how an action potential is propagated by reviewing the following slides:

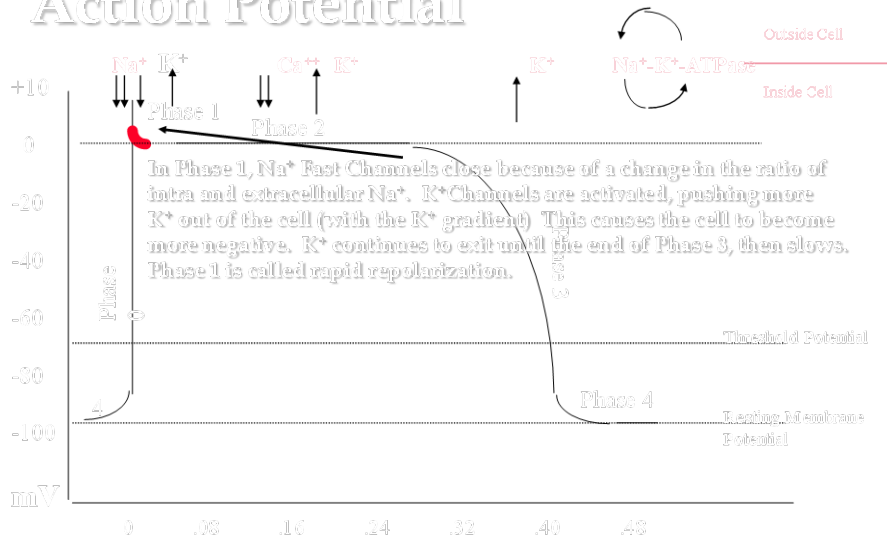
Action Potential



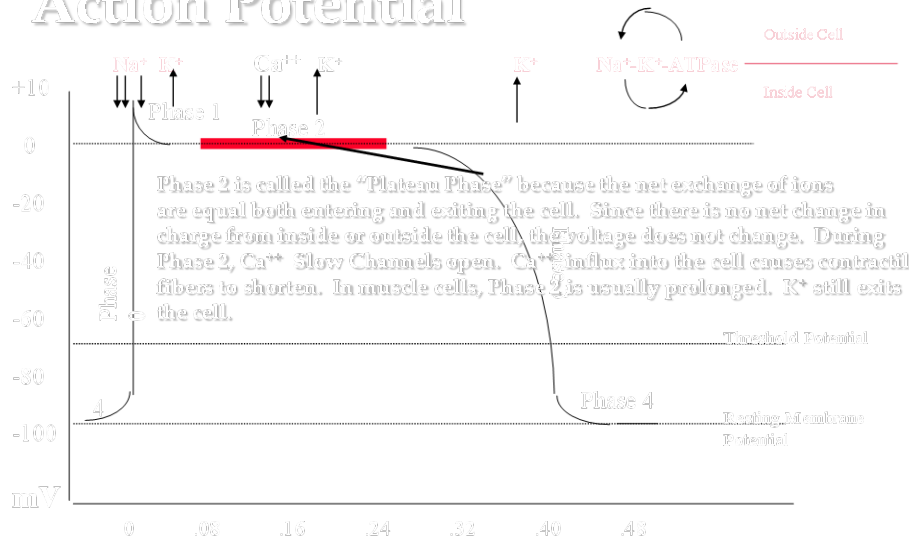
Action Potential



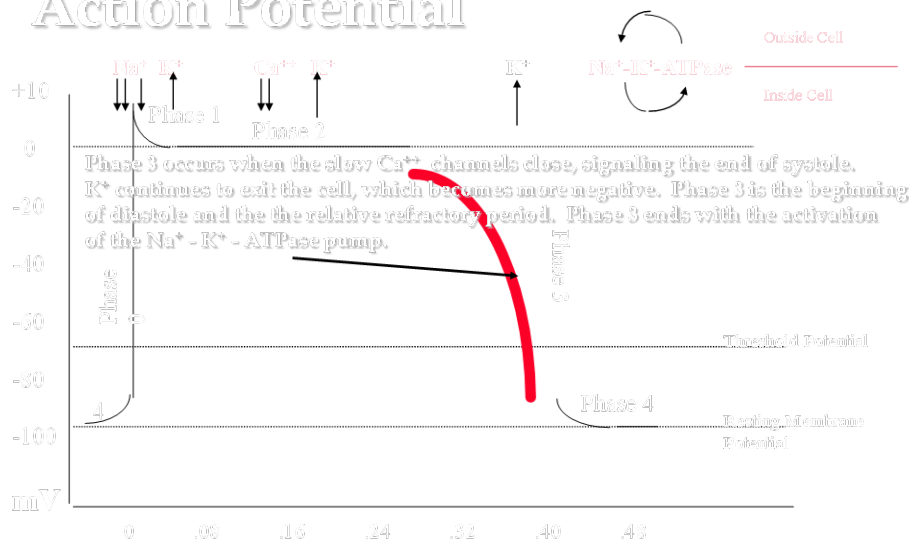
Action Potential



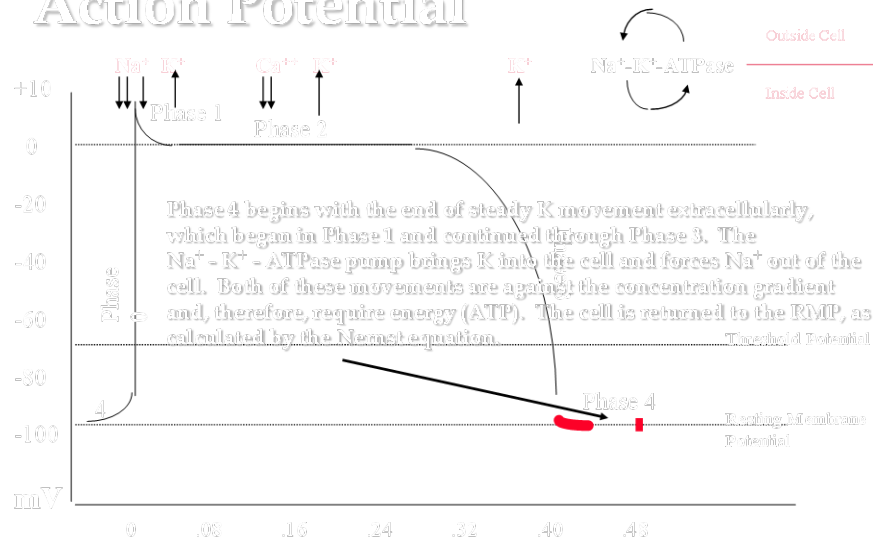
Action Potential



Action Potential



Action Potential



Antiarrhythmic drugs are classified on the basis of their electrophysiological properties

Class I Sodium Channel Blockers (IA, IB, IC)

Class II Beta Adrenergic Blockers

Class III Potassium Channel Blockers or general agents that delay repolarization

Class IV Calcium Channel Blockers

Diltiazem (Cardizem)

Diltiazem is a Calcium Channel Blocker and therefore has Class IV properties. It:

- Decrease slow inward current of Ca^{++}
- Decrease rate of spontaneous Phase 4 depolarization of pacemaker cells
- Negative chronotropic effects on SA/AV
- Negative dromotropic effects on AV
- Vasodilatation from calcium blockade (outermost receptor)
- Bind to open Ca^{++} channels (use-dependence [innermost receptor])
 - Works better on frequently open channels, such as with tachycardia

There are three types of Calcium Channel Blockers:

- Dihydropyridines
 - Nifedipine, ncardepine, amlodipine
 - Mostly vasodilators (outermost part of channel)
- Phenylalkylamine
 - Verapamil
 - Mostly rate control, more side effects
- Benzothiazepine
 - Diltiazem
 - Intermediate actions between nifedipine and verapamil
 - Will dilate coronary arteries
 - Will reduce afterload

- Will control rate in atrial fibrillation/flutter

Indications for Diltiazem

Supraventricular Tachydysrhythmias (Atrial fibrillation/atrial flutter)

Contraindications for Diltiazem

AV Block > 1st Degree
Bradydysrhythmias
Hypotension
Antidromic (Wide Complex) WPW
Ventricular Failure
Cardiomyopathy
Known hypersensitivity

Adverse Effects for Diltiazem

Hypotension
Nausea/vomiting
Dizziness
Bradycardia
Exacerbation of CHF

Dosage for Diltiazem

Diltiazem 0.25 mg/kg to max of 15 mg slow IV; may repeat at 0.35 mg/kg max of 15 mg

Administration Considerations

- Diltiazem requires refrigeration or must be replaced if at room temperature for >60 days.
- Preference for rate control medication is to stay with the class of drug the patient is already on. Thus if a patient has afib and is on a beta-blocker, your first-line medication should be metoprolol. If the patient has never had afib, or is on a calcium channel blocker, your first-line medication should be diltiazem. Of course, any contraindications would supersede that logic.
- If patient becomes hypotensive, stop administration and provide fluid challenge. If hypotension continues, administer 500 mg (one half ampule) of calcium chloride slow IV.

Procainamide (Procan SR, Pronestyl)

- Class IA antiarrhythmic similar to quinidine
- Less effective for supraventricular tachycardia
- More effective than quinidine for ventricular tachydysrhythmias
- 60% excreted unchanged in urine - renal failure patients may have toxicity problems
- Prolongs QT and may widen QRS complexes

Sodium Channel Blockade has 3 major effects

- Slows upstroke of Phase 0
 - Velocity of Sodium entry dictates adjacent cell depolarization
 - Slowing Vmax results in slowing conduction along myocardial fibers
 - May cause widening of QRS complex
- Suppress voltage-dependent and time-dependent recovery of channels
 - Class I meds do not change resting membrane potential
 - Increase leakage of K⁺ ions out of cell pushes phase 4 towards hyperpolarization

- Faster depolarization cycles (tachydysrhythmias) are more likely affected by Class I agents (use or state-dependence)
- Slow spontaneous diastolic depolarization in automatic fibers and fibers with abnormal (ischemic)automaticity
 - Increasing the amount of energy (ion movement required) for spontaneous depolarization
 - Prolonging or shortening Phase 3 (depending on agent)

Indications

Ventricular Tachycardia

Undifferentiated wide-complex tachycardia (Drug of Choice)

Adverse Effects for Procainamide:

Hypotension – especially with rapid admin

Nausea/vomiting

Widening QRS, prolonged QT, Junctional tachycardia, PVCs, Worsening heart block

Hypersensitivity reactions/allergies

Lupus-like rash

Lethargy, mental confusion, visual hallucinations

Diaphragmatic paralysis

Contraindications for Procainamide:

Pre-existing prolonged QT or Torsades de Pointes (TdP)

Complete heart block

2nd or 3rd degree heart block without pacemaker

Myasthenia gravis – Respiratory failure

Systemic Lupus Erythematosus

Hypotension (relative)

Dosage for Procainamide:

Procainamide IV - 20 mg/min until:

Dysrhythmia is suppressed

Maximum dose of 17 mg/kg or 1 gram is given

Hypotension occurs

QRS complex widens by 50% of original width

To administer:

Dilute 1000mg/2mL vial in 100mL (concentration 10 mg/mL) - administer 2 mL/min

DO NOT BOLUS PROCAINAMIDE!!

Use with caution in patients with

BBB

Occlusive heart disease, coronary occlusion

Suspected digitalis toxicity (added depressant effect)

Peripheral neuropathies may occur or worsen

Pressors, such as dopamine should be available to treat severe hypotension induced by

procainamide, however if BP falls 15 mmHg during infusion, stop it, wait for BP to respond to therapy before continuing.

Renal failure – drug (procainamide) and metabolite (N-acetylprocainamide [NAPA]) are active and excreted up to 60% unchanged in urine



Monroe Livingston Region Program Agency

Division of Prehospital Medicine, University of Rochester

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2011 Protocol Update Acknowledgement and ALS Provider Contract

I acknowledge that I have reviewed and understand the July 1, 2011 updates to the Monroe Livingston Regional EMS Standards of Care and will begin using them immediately.

Further, I acknowledge that the practice of prehospital advanced life support is a privilege granted to me by the agency and regional medical director through the Monroe-Livingston REMAC. To maintain that privilege, I agree to comply with the continuing medication education and skills maintenance required of my certification and affirm that I agree to abide by the policies and protocols of the Monroe- Livingston REMAC.

ALS Provider Name: _____

Signature: _____ **Date:** _____

*The original or a copy of this Provider Contract must be maintained on file
at each agency the Provider is affiliated with.*