2015 Guidelines:
ACLS Algorithm Overview

(Non-AHA supplementary precourse material)

Please read, print & bring to class 😊😊
**Pulseless Rhythms**  
(No Perfusion Despite Visible Cardiac Rhythm)

**Obtain:** O2, IV, Monitor/Defibrillator/Emergency Cart

Search for & treat underlying cause: “PATCH up the patient!”
- Pulmonary embolism
- Acute MI
- Acidosis
- Tension Pneumothorax
- Tablets/Toxins
- Cardiac Tamponade
- Hypo: volemia, oxia, glycemia, thermia, magnesemia
- Hyper & Hypo: kalemia

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**Shockable Pulseless Rhythms:**
Ventricular Fibrillation, Ventricular Tachycardia, Torsades de Pointes.

**First… Restore effective oxygenation, ventilation & circulation**

Begin high quality CPR asap: Compressions, Airway, Breathing
Defibrillate asap.
Resume CPR quickly after each shock, & give Epinephrine as soon as IV/IO in place.

**Continue…**
CPR x 2 min. (5 cycles of 30:2) & Drug > Shock
Rotate compressors every 2 min. Keep rhythm checks to 10secs or <.

<table>
<thead>
<tr>
<th>V. Fib., V.Tach</th>
<th>Torsades de Pointes with Long QT Interval</th>
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<tbody>
<tr>
<td>Epinephrine then…</td>
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<tr>
<td>Amiodarone or</td>
<td>Magnesium sulfate and/or</td>
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<tr>
<td>Lidocaine</td>
<td>Lidocaine (if Magnesium ineffective)</td>
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</tbody>
</table>

**Remember:**
* Max out one antiarrythmic before going on to the next. 1 loading dose than, ½ following dose
* Begin maintenance infusion of whichever antiarrythmic (above) resulted in conversion to perfusing rhythm.
* High quality CPR, early defibrillation & early Epi is of primary importance! Clinical interventions should not significantly delay/interrupt defibrillation or CPR!

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**Non-shockable Pulseless Rhythms:**
PEA (Pulseless Electrical Activity) & Asystole

Find and treat an immediately correctable cause. Think “PATCH!”

Begin high quality CPR asap! 5 cycles, of 30:2, 100-120/min or if intubated, deliver 10-12 ventilations per minute with uninterrupted chest compressions. (no pause for breaths) This means ventilate until the chest rises, every 6 seconds. No Hyperventilation.
**Bradycardia**
*(Ventricular Rate <60/min.)*

**Obtain:** O₂, Pulse Ox, IV, Monitor

Search for & treat underlying cause: “PATCH”

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**Stable: Adequate Perfusion**
Observe: EKG, vital signs, report any change in status.

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**Unstable: Poor Perfusion**
May be associated with symptoms such as: Chest pain, shortness of breath, decreased level of consciousness, hypotension, shock, ischemic chest pain, pulmonary congestion, or CHF.

Regardless of pacemaker site (wide or narrow QRS complex, or regular or irregular rhythms), **Rate enhancement is key!**
We must: Decrease vagal stimulus.
  - Increase conduction through the AV Node.
  - Provide regular & effective electrical stimulus to the Ventricles.

**Drug / Intervention:** Atropine is recommended for the bradycardic patient with signs of poor perfusion. While effective on some Bradycardias, Atropine may not affect high degree, 2nd Degree (Mobitz Type II), or 3rd Degree AV block. It may not affect Idioventricular rhythms as well. Denervated (transplanted) hearts will not respond to Atropine, but may respond to Isuprel. In these cases, anticipate & prepare for **Transcutaneous Pacing.**

**Dopamine** or **Epinephrine** infusions may be beneficial if there is a delay in pacing, or if pacing is ineffective. Remember, these drugs increase vasoconstriction, heart rate & B/P. Yet while aiding a slow heart rate, they can also cause myocardial ischemia. Use cautiously! **Transvenous Pacing** may be the ultimate solution!
**Tachycardia**
*(Ventricular Rate > 100 min.)*

**Obtain:** O2, Pulse Ox, IV, Monitor, Emergency Cart

**Seek expert consultation!**

**Note:** Most rate related symptoms are uncommon if heart rate is < 150. Seek expert consultation for any tachycardia in the presence of MI or poor perfusion.

Search for & treat underlying cause: “PATCH.”

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**Unstable Tachycardia:** Deliver Synchronized Cardioversion

**Inadequate Perfusion:** Ventricular Rate > 150 = Immediate Synchronized Cardioversion. Sedate conscious patient; do not delay cardioversion!

**Atrial Flutter or SVT:**
Start @ 50 - 100J for monophasic or biphasic cardioversion. Increase 2\(^{nd}\) and subsequent joules in gradual increments.

**Atrial Fibrillation:**
Start @ 200J, with an end point of 360J for monophasic cardioversion, & 120 – 200J for biphasic cardioversion. Increase 2\(^{nd}\) and subsequent joules in gradual increments.

**Monomorphic Ventricular Tachycardia:**
Start @ 100J for monophasic or biphasic cardioversion. Increase 2\(^{nd}\) and subsequent joules in gradual increments. If patient develops pulseless VT, defibrillate immediately!

**Polymorphic Ventricular Tachycardia:**
Very unstable! Use defibrillation doses(120-200J) for cardioversion. May require unsynchronized shock!

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**Stable Tachycardia:** Treat with Vagal Maneuvers &/ or Drugs

**Obtain:** O2, Pulse Ox, IV, Monitor, 12 Lead EKG

<table>
<thead>
<tr>
<th>Supraventricular Tachycardia</th>
<th>Ventricular Tachycardia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow QRS: Regular</td>
<td>Wide QRS: Regular &amp; Monomorphic</td>
</tr>
<tr>
<td>Vagal Maneuvers</td>
<td>Adenosine, then:</td>
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<tr>
<td>Adenosine, then:</td>
<td>Procainamide or</td>
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<tr>
<td>Beta Blocker or</td>
<td>Amiodarone or</td>
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<tr>
<td>Calcium Channel Blocker</td>
<td>Sotalol or Lidocaine</td>
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</tbody>
</table>
Tachycardia

Additional thoughts……..

When is doubt, always seek expert consultation!

Use heart rate, presence of “P” waves, and presenting signs & symptoms to differentiate between PSVT, SVT and Sinus Tachycardia. Remember, Sinus Tachycardia is a compensatory result of a “body” problem that can be easily treated by identifying the underlying cause (i.e. fever, dehydration, anemia), while PSVT & SVT is clearly a “cardiac” problem.

Identify between Supraventricular (narrow QRS) & Ventricular Tachycardias (wide ORS). Supraventricular Tachycardia with Bundle Branch Block can appear as a Ventricular rhythm. For the stable patient, try vagal maneuvers &/or 12 Lead EKG to help differentiate between Ventricular & Supraventricular rhythms. Vagal maneuvers generally slow Supraventricular, but not Ventricular rhythms. Adenosine is recommended for both instances however, the rhythm MUST be monomorphic.

With the exception of Adenosine, if the patient remains tachycardic after the next rate control drug is maxed out, do not give additional drugs. Compounding drugs may have a pro-arrhythmic effect on the heart. Let cardioversion be your “2nd drug.”

Tachycardias caused by unstable “re-entry” (premature beat lands on preceding “T” wave) such as SVT & VT, respond well to synchronized cardioversion. Unstable Atrial Fibrillation & unstable Atrial Flutter may also respond well to synchronized cardioversion.

Tachycardias caused by “automatic” pacemakers (pacemaker cells spontaneously depolarizing at a rapid rate ) such as Junctional Tachycardia, 2:1 Atrial Flutter, & Ectopic Atrial Tachycardia may respond better to drugs. Cardioversion is often ineffective & may actually increase the rate!

One more time…. When in doubt, always seek expert consultation!
**Acute Coronary Syndromes**

**Obtain:** Oxygen, IV, Monitor, 12 Lead EKG, CXR, Emergency Cart

**Immediate Treatment**

**Oxygen:** If O2 sat < 94%, begin O2 @ 4 liters/min. Titrate as needed (94 – 99%). Maintain a calm, reassuring atmosphere. Maintain patient in a comfortable position. May be detrimental to patients with ACS with O2 sat > 94%, who are not hypoxic.

**Aspirin:** 160 to 325 mg (given by EMS, otherwise give asap), crush or have patient chew tablets. Decreases platelet aggregation (clumping), & arterial constriction @ the site of ischemia or injury. ASA rectal suppository can be used for those who cannot tolerate ASA orally. Clopidogrel (Plavix) can be used by those with ASA allergy.

**Nitroglycerin:** Sublingual, spray, or IV for ischemic syndromes. Dilates coronary arteries, allowing more blood (oxygen) to reach the heart muscle, thus decreasing pain from ischemia. Dilates peripheral vessels which decrease afterload, and work of the heart. Note: Contraindicated in Right Ventricular injury or infarction (as it causes an acute drop in pulmonary pressures). Use caution in patients with systolic B/P <90 mm Hg, and within 24 hours use of phosphodiesterase inhibitors (ie., Viagra).

**Morphine Sulfate:** 2-4 mg. Acts as a pain & stress reliever. Dilates peripheral vessels which decrease afterload and work of the heart. Decreases acute cardiogenic pulmonary edema in normotensive patients. Use with caution for patients with Unstable Angina

**Immediate Assessment**

Perform a brief, targeted history & physical.

Complete fibrinolytic checklist.

Draw initial cardiac troponin, CRP, electrolytes and coagulation panels.

Evaluate 12 Lead EKG, categorize according to results, begin adjunctive treatment:

**ST Elevation / New LBBB (Myocardial Ischemia) = STEMI.** Reperfuse!!!!

Use as indicated: Beta Blockers, Clopidogrel, Heparin (UFH, LMWH).

If < 12 hrs from onset of symptoms, consider PCI (stent) within 90 mins., or fibrinolytics within 30 mins. (if fibrinolytic checklist is completed). Additional adjunctive support: ACE inhibitors or blockers & statin therapy.

**ST Depression / T wave inversion (Myocardial Injury) = UA/NSTEMI.** High Risk!!!!

Use as indicated: Nitroglycerin, Beta Blockers, Clopidogrel, Heparin (UFH or LMWH), Glycoprotein inhibitors. Monitor for homodynamic instability, ST changes, chest pain, V Tach. Perform Cardiac cath or stent placement as necessary within 48 hrs. of Acute MI. Additional support: Continue ASA, ACE inhibitors or blockers & statin therapy. Morphine should be given with caution for Unstable Angina, & if preload dependent.
No ST or T wave changes (Non-specific) = Intermediate – low risk. Continue serial 12 lead EKG’s & monitoring for ST changes. Continue serial Troponin. If changes occur, proceed to UA/NSTEMI algorithm. If unchanged and remains stable following Troponins & noninvasive imaging, patient may be discharged with cardiology follow up.

**Suspected Stroke & Immediate Post-Arrest Care** Algorithms will be covered during class 😊😊
Pulseless Rhythms
(No Perfusion Despite Visible Cardiac Rhythm)

Obtain: O2, IV, Monitor/Defibrillator/Emergency Cart

Search for & treat underlying cause: “PATCH up the patient!”

- Pulmonary embolism
- Acute MI
- Acidosis
- Tension Pneumothorax
- Tablets/Toxins
- Cardiac Tamponade
- Hypo: volemia, oxia, glycemia, thermia, magnesemia
- Hyper & Hypo: kalemia

Shockable Pulseless Rhythms: Think “PATCH”
Ventricular Fibrillation, Ventricular Tachycardia, Torsades de Pointes.

First… Restore effective oxygenation, ventilation & circulation

Begin high quality CPR asap: Compressions, Airway, Breathing
Defibrillate asap!
Resume CPR quickly after each shock, & give appropriate drug as soon as IV/IO in place.

Continue….
CPR x 2 min. {2 rescuer: Child - 5 cycles of 15:2 / Newborn - 15:2 compression to ventilation for arrest with cardiac etiology, or Newborn - 3:1 compression to ventilation for arrest due to asphyxia} & Drug > Shock.
Rotate compressors every 2 min. Keep rhythm checks to 10secs or <.

V. Fib., V.Tach  |  Torsades de Pointes with Long QT Interval
| Epinephrine   | Epinephrine               
| Amiodarone    | Magnesium sulfate        

Remember:
* Max out one antiarrythmic before considering another.
* Begin maintenance infusion of whichever antiarrythmic resulted in conversion to perfusing rhythm.
* High quality CPR & early defibrillation is of primary importance! Clinical interventions should not significantly delay/interrupt defibrillation or CPR!
Non-shockable Pulseless Rhythms:
PEA (Pulseless Electrical Activity) & Asystole

Find and treat an immediately correctable cause. Think “PATCH!”
Begin high quality CPR asap! 5 cycles, of 15:2, or if intubated, deliver 8-10 ventilations per minute with uninterrupted chest compressions. This means ventilate over 1 second, every 6 to 8 sec.
Epinephrine

**Bradycardia**
(Ventricular Rate <60/min.)

**Obtain:** O2, IV, Monitor, 12 Lead EKG, Emergency Cart

Search for & treat underlying cause: “PATCH”

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**Stable: Adequate Pulse, Perfusion, & Respirations**
Observe: EKG, vital signs, O2 as necessary, report any change in status.

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**Unstable: Poor Perfusion,**
May be associated with symptoms such as: Shortness of breath, dyspnea, cyanosis, decreased level of consciousness, hypotension, & shock.

Regardless of pacemaker site (wide or narrow QRS complex, or regular or irregular rhythms), rate enhancement with perfusion is key!

We must: Provide O2, ventilation & perfusion as needed.
Decrease vagal stimulus.
Increase conduction through the AV Node.
Provide regular & effective electrical stimulus to the Ventricles.

**Drug / Intervention:**
Begin CPR if heart rate <60/min., & showing no response to oxygenation & ventilation.
**Epinephrine** IV/IO or ET is our drug of choice to increase vasoconstriction, heart rate & B/P. **Atropine** will be effective on Bradycardias secondary to increased vagal tone or 1st & 2nd Degree AV Blocks. It will have little or no effect on Complete AV Block, Idioventricular rhythms, or on denervated (transplanted) hearts. In these cases, anticipate & prepare for **Trancutaneous Pacing.** **Transvenous Pacing** may be the ultimate solution!

Seek Expert Consultation!
Tachycardia
(Ventricular Rate > 100 min.)

Obtain: O2, IV, Monitor, 12 Lead EKG, Emergency Cart

Seek expert consultation!

Note: Most rate related symptoms are uncommon if heart rate is < 180 for children, or 220/min. for infants. Seek expert consultation for any tachycardia in the presence of poor perfusion. Rule out Sinus Tachycardia!

Search for & treat underlying cause: “PATCH.”

Unstable Tachycardia: Inadequate Perfusion With Pulse.
Ventricular Rate > 180/ min. for children, > 220 / min. for infants.
May be associated with symptoms such as: Shortness of breath, dyspnea, cyanosis, delayed capillary refill, decrease level of consciousness, hyptotension, & shock.

*Support patent airway & breathing.
*Attempt Vagal maneuver while preparing for Adenosine administration.
*If Adenosine delivery is delayed or unsuccessful, prepare for Synchronized Cardioversion. Sedate conscious patient; do not delay cardioversion.

Stable Tachycardia: Adequate Perfusion With Pulse.
Ventricular Rate > 180/ min. for children, > 220 / min. for infants.

Obtain: O2, IV, Monitor, 12 Lead EKG
*Support patent airway & breathing.
*Observe: EKG, vital signs, report any changes.
*Rule out Sinus Tachycardia! Use heart rate & presenting signs & symptoms to differentiate between SVT & Sinus Tachycardia. Remember, Sinus Tachycardia is a “body” problem, while SVT is clearly a “cardiac” problem.

Narrow QRS (0.09 or <): Regular  Wide QRS (0.09 or >): Regular & Monomorphic

Supraventricular Tachycardia  Possible Ventricular Tachycardia
Vagal Maneuvers
Adenosine, then:
Adenosine, then:
Adenosine
Amiodarone or
Procainamide

Again, seek expert consultation

Tachycardia

Additional thoughts……..

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Happy B-Day
Karen R.
Have a happy forever.