CARDIOPULMONARY ARREST – ADULT/ADOLESCENT NON-TRAUMATIC

Initial Procedures:

1. Initiate an organized, team-based CPR management approach with responders placed in designated positions around the patient and continue high quality CPR without interruption of continuous compressions unless pulse obtained during any step below:
    a. Use BVM/ETCO2 sensor for initial ventilation
        i. If cardiopulmonary arrest was witnessed by bystanders or EMS personnel and resources are limited, may consider passive ventilation procedure (OCEMS PR-025) for up to 6 minutes (3 CPR cycles).
    b. Continue chest compressions for a total of 200 compressions (approximately 2-minutes ~~s~~ cycle), which includes quality bystander CPR, then identify the rhythm and follow corresponding algorithm
        i. Ventricular fibrillation/Pulseless Wide Complex Tachycardia
        ii. Asystole/Pulseless Electrical Activity
        iii. ROSC

2. For all cardiac arrests, the following are indicated until ROSC is obtained or resuscitation is discontinued:
    a. Operate in 2-minute CPR cycles with the rhythm identified at the end of a 2-minute cycle driving the treatment plan over the next 2-minute cycle.
    b. Continue high quality CPR without interruption of continuous compressions, with personnel rotation every 2 minutes.
    c. If suspected opioid overdose, consider an opioid antagonist (e.g. naloxone)—See SO-M-50 and/or PR-126

    d. Continue BVM with ETCO2 sensor (or passive ventilation with limited resources) and high-flow oxygen.

    e. An advanced airway (ETT/SGA) may be placed at any time as long as chest compressions remain uninterrupted and tube placement can be confirmed.

        i. Intubate immediately with an endotracheal tube if clearly indicated (e.g. laryngeal edema from smoke inhalation)
    f. IV/IO vascular access after initial 2 minutes of high-quality CPR without interruption of compressions

Commented [GG1]: This is a newer BLS guideline.

Commented [HJ2R1]: I think this should move down with the Airway/ACCD/IV-IO information for all cardiac arrests.

g. Apply Automatic Chest Compression Device (ACCD) when available and with minimal interruption of compressions.

h. Providers may elevate patient head to 30 degrees semi-fowlers position if part of the workflow.

i. Providers can consider transport to nearest ERC any time after placement of ACCD

Commented [GG3]: AHA no longer recommends this unless part of a study.

3. *****If a rhythm with a pulse develops at any time (return of spontaneous circulation – ROSC), see ROSC section for post-ROSC care*****

VENTRICULAR FIBRILLATION (VF)
OR
PULSELESS WIDE COMPLEX TACHYCARDIA

1. After the initial 2 minutes of high-quality CPR, identify rhythm
   a. If rhythm is coarse VF/pulseless Wide Complex Tachycardia and defibrillator is available:
   ► **DEFIBRILLATE** once at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.
   b. If rhythm is fine ventricular fibrillation, consider compressions for an additional 2 minutes then reassess for defibrillation.
   c. Continue CPR immediately after defibrillation.

Commented [GG4]: Switched to prioritize manufacturer's setting over maximum setting, though both are acceptable.

2. After approximately 2 minutes of high-quality CPR, identify rhythm:
   a. If coarse VF or pulseless Wide Complex Tachycardia
   ► **DEFIBRILLATE** once at maximum energy setting or pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting
   b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole
   c. If PEA or asystole is identified during any rhythm check, refer to PEA/Asystole treatment sequence

3. During the next 2 minutes of high-quality CPR,

   Administer **EPINEPHRINE** **1 mg IV/IO** (0.1 mg/ml preparation), repeat approximately every 3-5 minutes for continued, or if reverts back to, VF/pulseless Wide Complex Tachycardia

4. After approximately 2 minutes of high-quality CPR, identify rhythm:
   a. For continued coarse VF/pulseless Wide Complex Tachycardia: **DEFIBRILLATE** once pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.

5. During the next 2-minute cycle of high-quality CPR for continued coarse VF/pulseless Wide Complex Tachycardia:

   a. Administer **AMIODARONE** **300 mg IV/IO**, may repeat **150 mg IV/IO** in approximately 3-5 minutes or **LIDOCAINE** **1 mg/kg IV/IO**, may repeat **0.5 mg/kg** in approximately 3-5 minutes one time.

6. After approximately 2 minutes of high-quality CPR, if there is continued coarse VF/pulseless Wide Complex Tachycardia:
   a. **DEFIBRILLATE** once at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.

7. For continued VF/ pulseless Wide Complex Tachycardia:
   a. Maintain high quality CPR without interruption of continuous compressions
   b. Continue to **DEFIBRILLATE** after every 2 minute rhythm check at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.
   c. After 10 minutes of initial cardiopulmonary arrest management, may consider administering either:
      SODIUM BICARBONATE **50 mL** of 7.5% solution IV/IO or **SODIUM BICARBONATE** **50 mL** of 8.4% solution IV/IO

Commented [GG5]: Made optional as AHA guidelines state that routine use is not necessarily indicated, but is optional.

8. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c
   a. Remain on scene and continue with treatment

b. Initiate transport to nearest ERC
c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field

PULSELESS ELECTRICAL ACTIVITY
OR
ASYSTOLE

1. For PEA and Asystole, continually monitor cardiac rhythm, give oxygen, and maintain high quality chest compressions without interruption of continuous compressions and
    a. Establish IV/IO access
    b. Administer **EPINEPHRINE 1 mg** IV/IO (0.1 mg/mL preparation) approximately every 3-5 minutes

2. If remains pulseless in PEA or in asystole:
    a. Apply Automatic Chest Compression Device when available
    b. Assess for reversible causes: Hypovolemia; Acidosis; Hypoxia; Tension pneumothorax; Hypothermia; Toxins
    c. Give **250 mL NORMAL SALINE** bolus, may repeat 3 times (total 1 liter) if no pulse obtained
    d. If pulses obtained, continue saline infusion up to 1 liter (auscultate lungs and stop saline if rales develop); follow post-ROSC care treatment sequence.
    e. Providers can consider transport to nearest ERC any time after placement of ACCD

3. If coarse VF/pulseless Wide Complex Tachycardia develops:
    a. **DEFIBRILLATE** once at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting and follow VF/pulseless Wide Complex Tachycardia algorithm
    b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole

4. For continued PEA or asystole:
    a. Maintain high quality CPR without interruption of continuous compressions
    b. After 10 minutes of initial cardiopulmonary arrest management, may consider administering administering either:
    SODIUM BICARBONATE 50 mL of 7.5% solution IV/IO or **SODIUM BICARBONATE 50 mL** of 8.4% solution IV/IO

Commented [GG6]: Made optional as AHA guidelines state that routine use is not necessarily indicated, but is optional.

5. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c
    a. Remain on scene and continue with treatment
    b. Initiate transport to nearest ERC
    c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field

RETURN OF SPONTANEOUS CIRCULATION—POST-ROSC CARE

If a rhythm with pulse develops at any time during the resuscitation (return of spontaneous circulation [ROSC]):

a. Continue to ventilate and oxygenate (ventilation via advanced airway, BVM or high flow oxygen as appropriate)
b. Assess for and correct hypoxia, hypovolemia, hypoglycemia, or hypothermia
c. Perform 12-lead ECG, if possible. If STEMI is identified, transmit to Base Hospital and/or CVRC
d. Make Base contact for CVRC destination
e. For a systolic BP < 90 mmHg, **Push-dose EPINEPHRINE 1 mL IV/IO** every 3 minutes to maintain a systolic BP > 90 mmHg.
Take the epinephrine preparation of 1 mg in 10 mL (0.1 mg/mL - cardiac epinephrine) and waste 9 mL of the epinephrine solution. Into that syringe, withdraw 9 mL of normal saline from the patient's IV bag, shake well (See OCEMS PR-230).
f. Continually monitor for re-arrest by palpating a pulse and monitoring ETCO2.
g. If respiratory depression or not breathing, and if not already done, consider Advanced Airway and confirm tube placement.

TREATMENT GUIDELINES:

Team-Based CPR - A position-based CPR response plan (e.g., Pit Crew CPR) that facilitates a coordinated effort in the management of cardiac arrest patients. Assigning personnel pre-determined positions and duties will support a focused and coordinated strategy maximizing the effectiveness of each EMS provider on scene. Each ALS provider agency needs to implement this type of formal position-based CPR response plan, although some flexibility is appropriate based on which delivery model is selected.

High Quality CPR - Priority in cardiopulmonary arrest management that emphasizes high quality CPR with minimal interruptions of chest compressions and with adequate depth and recoil. To maintain high quality CPR without interruption of continuous compressions, personnel should rotate through the compressor position every 2 minutes. High quality CPR includes: 1) the use of a CPR feedback device that can provide immediate feedback on compression depth, rate, and proper recoil; or 2) the placement of an automatic chest compression device (ACCD).

- **Minimizing Pauses** - High quality CPR should be performed while the defibrillator is charging with immediate CPR resumption post defibrillation. Focus should be to minimize the time off the chest during the defibrillation procedure while providing for personnel safety. A "hovering" technique is most widely used to accomplish minimal time off the chest before and after defibrillation.
- **CPR Cycles** - Structured intervals of high-quality CPR with brief rhythm checks performed approximately every two minutes. The identified rhythm guides the treatments delivered during the next CPR cycle. This approach is designed to minimize interruptions in chest compressions and aid in treatment decision making. While two minutes is considered best practice, the interval may be adjusted based on scene conditions and patient care needs.

Automatic Chest Compression Device (ACCD) - ACCD placement is indicated for pulseless patients where CPR is needed. If high quality CPR can be accomplished with a CPR feedback device, then placement of the ACCD can occur at any point in the management of cardiac arrest patients prior to their movement or transport. Once providers initiate patient movement or transport, an ACCD is required since the ability to perform high quality manual compressions diminishes during this activity. Patients can be managed with manual CPR on scene, as long as paramedics utilize a CPR feedback device to deliver and monitor high quality compressions with minimal interruptions. If providers cannot perform manual high-quality compressions with minimal interruptions, then the ACCD should be applied as soon as possible.

Positive Pressure Ventilation – This is the preferred method of ventilating a cardiac arrest patient. Avoid hyperventilation during cardiac arrest management and post ROSC care. Ventilations should be approximately 10 breaths/minute with just enough volume to see the chest rise. A two-person technique (when resources allow) should be utilized when delivering ventilations using a BVM. AHA guidelines recommend a 30:2 ventilation to compression ratio, but continuous CPR is acceptable as well.

ALS Airway - An ALS airway (e.g., SGA, ETT) may be placed at any time during the management of a cardiac arrest patient as long as CPR is not interrupted. ALS airway selection by paramedics should be based upon patient presentation, scene conditions, and confidence in successful placement. If Endotracheal Intubation is attempted and unsuccessful, an SGA should be utilized

Passive Ventilation – The use of the passive ventilation procedure is indicated for any cardiopulmonary arrest that is witnessed by either bystanders or EMS personnel to prioritize chest compressions when there are scarce resources available. However, passive oxygenation does not ensure adequate ventilation. As such, once an adequate number of personnel are on scene, positive pressure ventilations utilizing a BVM with an EtCO2 sensor should be performed. Refer to OCEMS PR-025, Passive Ventilation Procedure, for further information.

Defibrillation – Emergent defibrillation is highly effective for terminating VF/pVT

- A single shock strategy is preferred over stacked shocks due to the long duration of CPR interruption for a series of stacked shocks.
- The energy level is best based on the manufacturer recommendations, but if that is not available, a higher energy setting may be preferred.
- There is not yet convincing evidence of benefit for vector-change (VC) defibrillation or double-sequential-defibrillation (DSD)

Fine Ventricular Fibrillation (Fine VF) - Patients in a cardiac rhythm of fine ventricular fibrillation (amplitude less than 2-3 mV) may benefit from an additional 2 minutes of high-quality CPR without interruption of continuous compressions. Fine ventricular fibrillation has a low success rate for conversion with defibrillation, thus continuing high quality CPR without interruption of continuous compressions for an additional 2 minutes may allow for further coronary perfusion and presentation of a coarser ventricular fibrillation upon reassessment of the rhythm.

End-Tidal CO2 - Obtaining initial ETCO2 values when utilizing a BVM and then monitoring the values will provide additional information on patient perfusion status while performing high quality CPR.

- Due to lack of perfusion, ETCO2 is low during cardiac arrest (<<10 mmHg), but a jump in ETCO2 to 10-20 mmHg during CPR may indicate ROSC
- A persistent ETCO2 <10 mmHg after 20 minutes of CPR had a very low survival (0.5% chance of ROSC).

ROSC – Preventing re-arrest is the primary goal. Continually monitoring for a palpable pulse, rhythm changes and ETCO2 waveform is required. Maintaining a systolic BP > 90 mmHg should take priority over 12-lead acquisition post ROSC to prevent re-arrest. ETCO2 target range is 35-45 mmHg.

Non-Vasopressor Medications – AHA Guidelines state that routine use of medications such as calcium, magnesium, sodium bicarbonate, and steroids do not have a survival benefit, but may be useful in specific cases.

AICD - If the patient has an implanted pacemaker or defibrillator/pacemaker, place electrode pads to either side or in the anterior/posterior position and not directly on top of the implanted device.

Medication Patches - If the patient has a medication patch in place on the chest area, remove the patch and wipe the area clean before attaching an electrode pad.

If a patient is wearing a LifeVest®

- Proceed with standard evaluation and treatment measures.
- Initiate CPR unless the vest device is broadcasting "press the response buttons," "electrical shock possible, do not touch patient," or "bystanders do not interfere."
- Follow standard treatment as described in algorithms above, remove the LifeVest®, and monitor/treat the patient with the standard monitor-defibrillator.
- To remove the LifeVest®, first pull out or disconnect the battery, then remove the garment from the patient.
- Take vest, modem, charger, and extra battery to the hospital.

LVAD - If the patient has a Left Ventricular Assist Device (**LVAD**), Reference SO-C-045 (Cardiac Arrest with Left Ventricular Assist Device.

ALS providers should maintain an adequate supply of epinephrine to ensure enough supply is present to treat cardiac arrest patients according to this policy. Should supplies become limited, consider withholding further doses of epinephrine after 20 minutes of CPR. If consideration is being given to using expired epinephrine, only administer a total of 3 doses during a cardiac arrest.

CARDIOPULMONARY ARREST – ADULT/ADOLESCENT NON-TRAUMATIC

Initial Procedures:

1. Initiate an organized, team-based CPR management approach with responders placed in designated positions around the patient and continue high quality CPR without interruption of continuous compressions unless pulse obtained during any step below:
   - ~~a. Ideally, U~~use BVM/ETCO2 sensor for initial ventilation ~~or other non-endotracheal airway unless endotracheal tube is clearly indicated (example: laryngeal edema from smoke inhalation)~~
     - ~~a.~~i. If cardiopulmonary arrest was witnessed by bystanders or EMS personnel and resources are limited, may consider passive ventilation procedure (OCEMS PR-025) for ~~a total of~~up to 6 minutes (3 CPR cycles). ~~Otherwise use BVM/ETCO2 sensor for initial ventilation or other non-endotracheal airway unless endotracheal tube is clearly indicated (example: laryngeal edema from smoke inhalation)~~
   - ~~b. If possible at scene, elevate patient head to 30 degrees semi-fowlers position.~~
   - b. Continue chest compressions for a total of 200 compressions (approximately ~~2~~ 2-minute~~s~~ cycle), which includes quality bystander CPR, then ~~reassess~~ identify the rhythm and follow corresponding algorithm
     - i. Ventricular fibrillation/Pulseless Wide Complex Tachycardia
     - ii. Asystole/Pulseless Electrical Activity
     - iii. ROSC

     ~~In addition,~~
   - ~~c. If suspected opioid overdose, consider an opioid antagonist (e.g. naloxone) See SO-M-50 and/or PR-126~~

~~2. If, Aa~~fter 2 minutes of high~~-~~ quality CPR, ~~the patient remains pulseless,~~
   - ~~a. Identify the rhythm and follow corresponding algorithm~~
     - ~~i. Ventricular fibrillation/Pulseless Wide Complex Tachycardia~~
     - ~~ii. Asystole/Pulseless Electrical Activity~~

     ~~In addition,~~

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Commented [GG1]: Moved to primary ventilation method as per AHA guidelines which specifically de-emphasize passive ventilation.

No comment was made regarding 30:2 ratio vs. continuous CPR due to no clear winner in technique, and ACCD use precludes the 30:2 ratio.

Commented [HJ2]: My thought is that advanced airway placement "at any time" is already covered below, and it takes time to set up to intubate. So crews that can manage airway are going to start with a BVM anyway versus ignoring it to setup for intubation.

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3. For all cardiac arrests, the following are indicated until ROSC is obtained or resuscitation is discontinued:
    a. Operate in 2-minute CPR cycles with the rhythm identified at the end of a 2-minute cycle driving the treatment plan over the next 2-minute cycle.
    ~~d.~~ Continue high quality CPR without interruption of continuous compressions, with personnel rotation every 2 minutes. ~~and provide~~
    b. If suspected opioid overdose, consider an opioid antagonist (e.g. naloxone) See SO-M-50 and/or PR-126
    c. ~~High-flow oxygen by either~~Continue BVM with ETCO2 sensor (or passive ventilation with limited resources) and high-flow oxygen.
    d. An advanced airway (ETT/SGA) may be placed at any time as long as chest compressions remain uninterrupted and tube placement can be confirmed.
        i. Intubate immediately with an endotracheal tube if clearly indicated (e.g. laryngeal edema from smoke inhalation)
    e. IV/IO vascular access after initial 2 minutes of high-quality CPR without interruption of compressions
    f. Apply Automatic Chest Compression Device (ACCD) when available and with minimal interruption of compressions.
    ~~f.~~g. Providers may elevate patient head to 30 degrees semi-fowlers position if part of the workflow.
    ~~g.~~h. Providers can consider transport to nearest ERC any time after placement of ACCD

~~2.~~4. ***If a rhythm with a pulse develops at any time (return of spontaneous circulation – ROSC), see ROSC section for post-ROSC care***

VENTRICULAR FIBRILLATION (VF)
OR
PULSELESS WIDE COMPLEX TACHYCARDIA

1. After the initial 2 minutes of high-quality CPR, identify rhythm

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Commented [GG7]: AHA no longer recommends this unless part of a study.

a. If rhythm is coarse VF/pulseless Wide Complex Tachycardia and defibrillator is available:
► **DEFIBRILLATE** once at ~~maximum energy setting or~~ pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.

b. If rhythm is fine ventricular fibrillation, ~~continue~~ consider compressions for an additional 2 minutes then reassess for defibrillation.

~~b.~~c. Continue CPR immediately after defibrillation.

2. After approximately 2 minutes of high-quality CPR, identify rhythm:~~Monitor cardiac rhythm:~~
   a. If coarse VF or pulseless Wide Complex Tachycardia
   ► **DEFIBRILLATE** once at maximum energy setting or pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting
   b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole
   c. If PEA or asystole is identified during any rhythm check,~~:~~ refer to PEA/Asystole treatment sequence

3. During the next 2 minutes of high-quality CPR, ~~For continued VF/ pulseless Wide Complex Tachycardia or if reverts back to VF/ pulseless Wide Complex Tachycardia:~~
   ~~a. Maintain high quality CPR without interruption of continuous compressions~~
   ~~b.~~ Administer **EPINEPHRINE 1 mg IV/IO** (0.1 mg/ml preparation), repeat approximately every 3-5 minutes for continued, or if reverts back to, VF/pulseless Wide Complex Tachycardia

4. After approximately 2 minutes of high-quality CPR, identify rhythm: ~~For continued coarse VF/pulseless Wide Complex Tachycardia:~~
   a. ~~M~~For continued coarse VF/pulseless Wide Complex Tachycardia:~~aintain high quality CPR without interruption of continuous compressions~~
   ~~b.~~ **DEFIBRILLATE** once ~~at maximum energy setting or~~ pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.

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5. During the next 2-minute cycle of high-quality CPR ~~F~~for continued coarse VF/pulseless Wide Complex Tachycardia:
    ~~a. Maintain high quality CPR without interruption of continuous compressions~~
    ~~b.~~a. Administer **AMIODARONE 300 mg IV/IO**, may repeat **150 mg IV/IO** in approximately 3-5 minutes or **LIDOCAINE 1 mg/kg IV/IO**, may repeat **0.5 mg/kg** in approximately 3-5 minutes one time.

6. After approximately 2 minutes of high-quality CPR, if there is continued coarse VF/pulseless Wide Complex Tachycardia:
    a. **DEFIBRILLATE** once at ~~maximum energy setting or~~ pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.

7. For continued VF/ pulseless Wide Complex Tachycardia:
    a. Maintain high quality CPR without interruption of continuous compressions
    b. ~~After 10 minutes of initial cardiopulmonary arrest management, or immediately after ROSC is achieved and an advanced airway is indicated, consider placement of an endotracheal tube (if other ALS airways have not been utilized). Confirm tube placement without interruption of continuous compressions, maintaining high quality CPR~~ Continue to **DEFIBRILLATE** after every 2 minute rhythm check at pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting.
    c. After 10 minutes of initial cardiopulmonary arrest management, may consider administering either:
    SODIUM BICARBONATE 50 mL of 7.5% solution IV/IO or **SODIUM BICARBONATE 50 mL** of 8.4% solution IV/IO

8. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c
    a. Remain on scene and continue with treatment
    b. Initiate transport to nearest ERC
    c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field

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PULSELESS ELECTRICAL ACTIVITY
OR
ASYSTOLE

1. For PEA and Asystole, continually monitor cardiac rhythm, give oxygen, and maintain high quality chest compressions without interruption of continuous compressions and
    a. Establish IV/IO access
    b. Administer **EPINEPHRINE 1 mg** IV/IO (0.1 mg/mL preparation) approximately every 3-5 minutes

2. If remains pulseless in PEA or in asystole:
    a. Apply Automatic Chest Compression Device when available
    b. Assess for reversible causes: Hypovolemia; Acidosis; Hypoxia; Tension pneumothorax; Hypothermia; Toxins
    c. Give **250 mL NORMAL SALINE** bolus, may repeat 3 times (total 1 liter) if no pulse obtained
    d. If pulses obtained, continue saline infusion up to 1 liter (auscultate lungs and stop saline if rales develop); ~~transport to CVRC per Base Contact~~follow post-ROSC care treatment sequence.
    e. Providers can consider transport to nearest ERC any time after placement of ACCD

3. If coarse VF/pulseless Wide Complex Tachycardia develops:
    a. **DEFIBRILLATE** once at ~~maximum energy setting or~~ pre-programmed/manufacturer's recommended defibrillator setting or at maximum energy setting and follow VF/pulseless Wide Complex Tachycardia algorithm
    b. If rhythm is identified as fine ventricular fibrillation, continue compressions for 2 minutes then reassess. If fine V-fib persists, then treat as PEA/asystole

~~4. If a rhythm with pulse develops (return of spontaneous circulation [ROSC]):~~
    ~~a. Ventilate and oxygenate~~
    ~~b. Assess for and correct hypoxia, hypovolemia, or hypothermia~~

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~~c. Perform 12 lead ECG if possible. If STEMI is identified, transmit to Base Hospital and/or CVRC~~

~~d. Make Base contact for CVRC destination~~

~~e. Consider placement of an Advanced Airway and confirm tube placement~~

~~5.~~4. For continued PEA or asystole:

a. Maintain high quality CPR without interruption of continuous compressions

~~b. After 10 minutes of initial cardiopulmonary arrest management, or immediately after ROSC is achieved and an advanced airway is indicated. consider placement of an endotracheal tube (if other ALS airways have not been utilized). Confirm tube placement without interruption of continuous compressions, maintaining high quality CPR.~~

~~c.~~b. After 10 minutes of initial cardiopulmonary arrest management, may consider administering administering either:

SODIUM BICARBONATE 50 mL of 7.5% solution IV/IO or **SODIUM BICARBONATE 50 mL** of 8.4% solution IV/IO

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~~6.~~5. After 20 minutes of management on scene without ROSC, consider one of the following actions. After 30 minutes on scene without ROSC, select option b or c

a. Remain on scene and continue with treatment
b. Initiate transport to nearest ERC
c. Make Base contact for further resuscitation orders or request pronouncement of patient in the field

RETURN OF SPONTANEOUS CIRCULATION—POST-ROSC CARE

If a rhythm with pulse develops at any time during the resuscitation (return of spontaneous circulation [ROSC]):

a. Continue to ~~V~~ventilate and oxygenate (ventilation via advanced airway, BVM or high flow oxygen as appropriate)
b. Assess for and correct hypoxia, hypovolemia, hypoglycemia, or hypothermia
c. Perform 12-lead ECG, if possible. If STEMI is identified, transmit to Base Hospital and/or CVRC
d. Make Base contact for CVRC destination

e. For a systolic BP < 90 mmHg, **Push-dose EPINEPHRINE 1 mL IV/IO** every 3 minutes to maintain a systolic BP > 90 mmHg.
Take the epinephrine preparation of 1 mg in 10 mL (0.1 mg/mL - cardiac epinephrine) and waste 9 mL of the epinephrine solution. Into that syringe, withdraw 9 mL of normal saline from the patient's IV bag, shake well (See OCEMS PR-230).

~~d.~~f. Continually monitor for re-arrest by palpating a pulse and monitoring ETCO2.

~~e.~~g. If respiratory depression or not breathing, and if not already done, consider Advanced Airway and confirm tube placement.

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TREATMENT GUIDELINES:

Team-Based CPR - A position-based CPR response plan (e.g., Pit Crew CPR) that facilitates a coordinated effort in the management of cardiac arrest patients. Assigning personnel pre-determined positions and duties will support a focused and coordinated strategy maximizing the effectiveness of each EMS provider on scene. Each ALS provider agency needs to implement this type of formal position-based CPR response plan, although some flexibility is appropriate based on which delivery model is selected.

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- **Minimizing Pauses** - High quality CPR should be performed while the defibrillator is charging with immediate CPR resumption post defibrillation. Focus should be to minimize the time off the chest during the defibrillation procedure while providing for personnel safety. A "hovering" technique is most widely used to accomplish minimal time off the chest before and after defibrillation.

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- **CPR Cycles** - Structured intervals of high-quality CPR with brief rhythm checks performed approximately every two minutes. The identified rhythm guides the treatments delivered during the next CPR cycle. This approach is designed to minimize interruptions in chest compressions and aid in treatment decision making. While two minutes is considered best practice, the interval may be adjusted based on scene conditions and patient care needs.

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Automatic Chest Compression Device (ACCD) - ACCD placement is indicated for pulseless patients where CPR is needed. If high quality CPR can be accomplished with a CPR feedback device, then placement of the ACCD can occur at any point in the management of cardiac arrest patients prior to their movement or transport. Once providers initiate patient movement or transport, an ACCD is required since the ability to perform high quality manual compressions diminishes during this activity. Patients can be managed with manual CPR on scene, as long as paramedics utilize a CPR feedback device to deliver and monitor high quality compressions with minimal interruptions. If providers cannot perform manual high--quality compressions with minimal interruptions, then the ACCD should be applied as soon as possible.

~~A position-based CPR response plan (e.g., Pit Crew CPR) will facilitate a coordinated effort in the management of cardiac arrest patients. Assigning personnel pre-determined positions and duties will support a focused and coordinated strategy maximizing the effectiveness of each EMS provider on scene. Each ALS provider agency needs to implement this type of formal position-based CPR response plan, although some flexibility is appropriate based on which delivery model is selected.~~

~~High quality CPR should be performed while the defibrillator is charging with immediate CPR resumption post defibrillation. Focus should be to minimize the time off the chest during the defibrillation procedure while providing for personnel safety. A "hovering" technique is most widely used to accomplish minimal time off the chest before and after defibrillation.~~

Positive Pressure Ventilation – This is the preferred method of ventilating a cardiac arrest patient. Avoid hyperventilation during cardiac arrest management and post ROSC care. Ventilations should be approximately 10 breaths/minute with just enough volume to see the chest rise. A two-person technique (when resources allow) should be utilized when delivering ventilations using a BVM. AHA guidelines recommend a 30:2 ventilation to compression ratio, but continuous CPR is acceptable as well.

~~Unless passive ventilation is in use, alternate~~**ALS Airway** - An ALS airway~~s~~ (e.g., ~~iGel, etc~~SGA, ETT~~.~~) may be placed at any time during the management of a cardiac arrest patient as long as CPR is not interrupted. ALS airway selection by paramedics should be based upon patient presentation, scene conditions, and confidence in successful placement. If Endotracheal Intubation is attempted and unsuccessful, an SGA should be utilized~~Endotracheal intubation should be withheld until at least 10 minutes into the~~

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~~management of the cardiac arrest patient unless more urgent clinical indications are present (e.g., swelling, burns, etc.).~~

Passive Ventilation – The ~~U~~use of the passive ventilation procedure is indicated for any cardiopulmonary arrest that is witnessed by either bystanders or EMS personnel to prioritize chest compressions when there are scarce resources available. However, passive oxygenation does not ensure adequate ventilation. As such, once an adequate number of personnel are on scene, positive pressure ventilations utilizing a BVM with an EtCO2 sensor should be performed. Refer to OCEMS PR-025, Passive Ventilation Procedure, for further information.

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Defibrillation – Emergent defibrillation is highly effective for terminating VF/pVT

- A single shock strategy is preferred over stacked shocks due to the long duration of CPR interruption for a series of stacked shocks.
- The energy level is best based on the manufacturer recommendations, but if that is not available, a higher energy setting may be preferred.
- There is not yet convincing evidence of benefit for vector-change (VC) defibrillation or double-sequential-defibrillation (DSD)

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Fine Ventricular Fibrillation (Fine VF) - Patients in a cardiac rhythm of fine ventricular fibrillation (amplitude less than 2-3 mV) may benefit from an additional 2 minutes of high-quality CPR without interruption of continuous compressions. Fine ventricular fibrillation ~~does not have a high~~has a low success rate for conversion with defibrillation, thus continuing high quality CPR without interruption of continuous compressions for an additional 2 minutes may allow for further coronary perfusion and presentation of a coarser ventricular fibrillation upon reassessment of the rhythm.

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End-Tidal CO2 - Obtaining initial ETCO2 values when utilizing a BVM and then monitoring the values will provide additional information on patient perfusion status while performing high quality CPR.

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- Due to lack of perfusion, ETCO2 is low during cardiac arrest (<<10 mmHg), but a jump in ETCO2 to 10-20 mmHg during CPR may indicate ROSC
- A persistent ETCO2 <10 mmHg after 20 minutes of CPR had a very low survival (0.5% chance of ROSC).

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ROSC – Preventing re-arrest is the primary goal. Continually monitoring for a palpable pulse, rhythm changes and ETCO2 waveform is required. Maintaining a systolic BP > 90 mmHg should take priority over 12-lead acquisition post ROSC to prevent re-arrest. ETCO2 target range is 35-45 mmHg.

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Non-Vasopressor Medications – AHA Guidelines state that routine use of medications such as calcium, magnesium, sodium bicarbonate, and steroids do not have a survival benefit, but may be useful in specific cases.

AICD - If the patient has an implanted pacemaker or defibrillator/pacemaker, place electrode pads to either side or in the anterior/posterior position and not directly on top of the implanted device.

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Medication Patches - If the patient has a medication patch in place on the chest area, remove the patch and wipe the area clean before attaching an electrode pad.

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If a patient is wearing a LifeVest®

- Proceed with standard evaluation and treatment measures.
- Initiate CPR unless the vest device is broadcasting "press the response buttons," "electrical shock possible, do not touch patient," or "bystanders do not interfere."
- Follow standard treatment as described in algorithms above, remove the LifeVest®, and monitor/treat the patient with the standard monitor-defibrillator.
- To remove the LifeVest®, first pull out or disconnect the battery, then remove the garment from the patient.
- Take vest, modem, charger, and extra battery to the hospital.

~~If Base Hospital orders push-dose epinephrine for refractory hypotension, refer to ALS Procedure #230 (Push-Dose Epinephrine) for technique in performing procedure.~~

LVAD - If the patient has a Left Ventricular Assist Device (**LVAD**), Reference SO-C-045 (Cardiac Arrest with Left Ventricular Assist Device.

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ALS providers should maintain an adequate supply of epinephrine to ensure enough supply is present to treat cardiac arrest patients according to this policy. Should supplies become limited, consider withholding further doses of epinephrine after 20 minutes of CPR. If consideration is being given to using expired epinephrine, only administer a total of 3 doses during a cardiac arrest.