

C-P1 HIGH PERFORMANCE/ PIT-CREW CPR		
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### Goals of Pit-Crew Resuscitation

Time	Goal	Primary Interventions
0:00 - 1:00	<b>AED/Monitor</b>	<ul style="list-style-type: none"> <li>Place AED/Monitor by patient's head</li> <li>Place Pads on patient</li> </ul>
1:00 - 2:00	<b>BIAD/Airway</b>	<ul style="list-style-type: none"> <li>Place BIAD &amp; attach to O2/Ambu Bag</li> </ul>
<b>10 Second Pause (or Less) - Pulse Check/Defibrillate</b>		
2:00 - 4:00	<b>IO/Fluids</b>	<ul style="list-style-type: none"> <li>IO Placement</li> <li>Start IV Fluids</li> <li>ALS Epinephrine #1</li> </ul>
4:00 - 6:00	<b>Clean-Up</b>	<ul style="list-style-type: none"> <li>Advanced Monitoring (SpO<sub>2</sub>/ETCO<sub>2</sub>)</li> </ul>
<b>Continue Additional Resuscitation &amp; Repeat as Necessary</b>		
Additional 0:00 - 2:00		<ul style="list-style-type: none"> <li>ALS Amiodarone/Lidocaine #1 &amp; #2</li> <li>ALS Epinephrine #2 &amp; #3</li> </ul>
Additional 2:00 - 4:00		
<b>Repeat Additional 0:00 - 4:00</b>		
<b>After 20-30 minutes of Resuscitation, Consider Termination of Resuscitation per Guideline, or Transport to nearest appropriate facility</b>		

## Key Points:

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The order of these interventions is based on evidence that supports their impact first on **long-term neurologic survival**, then on short-term survival/ROSC and finally on interventions that have limited to no evidence supporting improved clinical outcomes, but are standard or recommended practices.

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### Order of Importance:

- 1st = CPR
- 2nd = Defibrillation
- 3rd = Oxygenation/Airway
- 4th = Ventilation
- 5th = IO (IV) Access
- 6th = Medications & Fluids
- Other interventions: Lucas (or similar Mechanical CPR Device) & SpO2/EtCO2 Monitor

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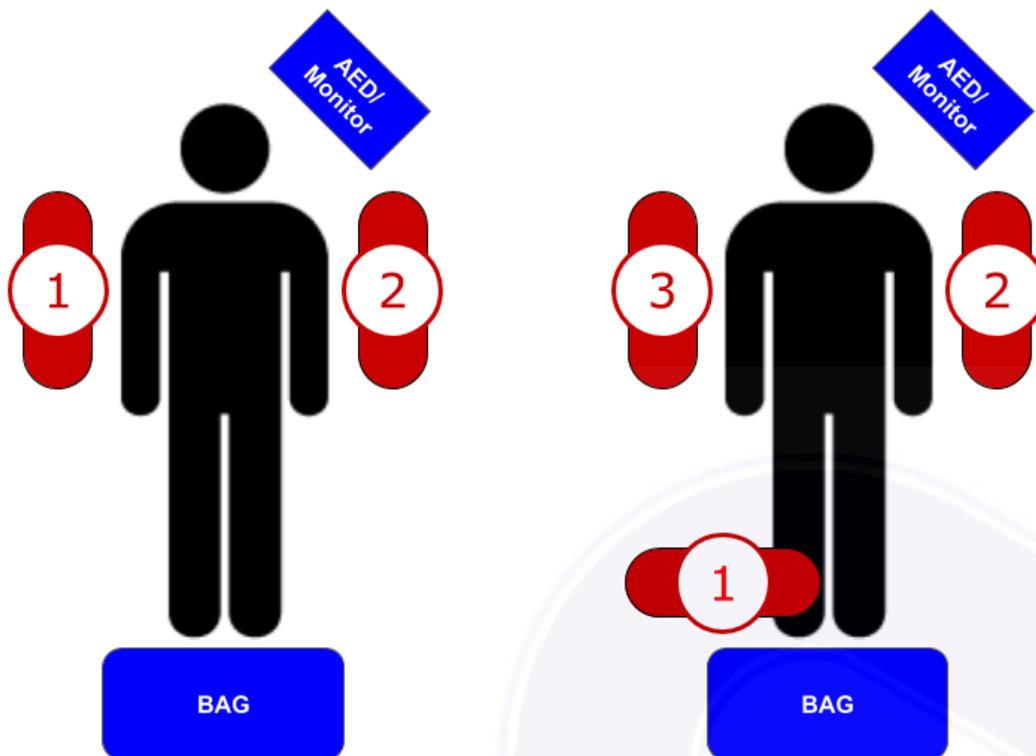
### ● **High quality CPR includes:**

- Starting CPR as soon as possible (including bystander and dispatch-directed CPR)
  - Minimizing interruptions during CPR (Continuous Chest Compressions)
  - Compression Rate of 100-120/minute
  - Compression Depth of 2 or more inches in adults (or 1/3rd the depth of the chest in children)
  - Allowing Full Chest Recoil with each compression (no leaning on the chest)
  - Avoid excessive ventilation (<12 breaths per minute and using only minimal chest rise)
  - Maintaining EtCO2 >20 if possible (at least >10)
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- The only two interventions that have shown a significant benefit to long-term mortality in cardiac arrests are early high-quality CPR and early defibrillation.
  - For witnessed cardiac arrests (i.e. not a primary respiratory arrest), blood oxygenation is generally adequate for several minutes after arrest
  - Medications have shown minimal if any significant long-term mortality benefit and should be used only after BLS measures have been ensured.

- With a witnessed cardiac arrest by EMS:
  - Focus should be on CPR first and then defibrillation
  - Passive O2 should be initiated ASAP by
    - a non-rebreather with OPA or
    - via an BIAD with high flow O2 attached
- For probable primary respiratory arrests or arrests with downtime prior to initiation of CPR:
  - These patients do NOT have adequate blood oxygenation
  - Early BIAD placement and oxygenation/ventilation should be performed in conjunction with CPR

## Two Provider High-Performance CPR Model

Note: The Four Provider adaptation of this model is presented in a following section.



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## 2 Provider Overview

Lead Provider		Provider 2*
AEMT (BLS), or Paramedic (ALS)	<b>Time</b>	MFR, EMT, or AEMT
Identify "No Pulse" & Start CPR	0:00 - 2:00  <u>Goal:</u> AED/Monitor & Airway/O2	<b>(1) AED/Monitor:</b> place by head <b>(2) Defib Pads:</b> place and attach to AED/Monitor <b>(3) Place BIAD</b> and attach Ambu Bag <b>(4) Ventilate as able</b> @1:45 Charge Defib
Check Pulse	Pause	AED/Shock
<b>(1) Place IO &amp; start NS Bolus</b> <b>(2) Ventilate</b> <b>(ALS) Epinephrine #1</b> @3:45 Charge Defib	2:00-4:00  <u>Goal:</u> IO/Meds	<b>CPR</b>
Check Pulse	Pause	AED/Shock
Place Mechanical CPR Device <i>(if available)</i>		
<b>CPR**</b>	4:00 - 6:00  <u>Goal:</u> "Clean Up"	<b>(1) Monitors:</b> attach SpO2 and EtCO2 <b>(2) Ventilate as able</b> @+5:45 Charge Defib
Check Pulse	Pause	AED/Shock

*Continue as per next page*

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Continue Additional Resuscitation & Repeat as Necessary		
<b>(1) Ventilate</b> <b>(ALS) Epi doses (max 3)</b> <b>(ALS) Amio/Lido doses (max 2)</b> <b>@+1:45 Charge Defib</b>	Additional 0:00 - 2:00	<b>CPR</b>
Check Pulse	Pause	AED/Shock
<b>CPR**</b>	Additional 2:00 - 4:00	<b>(1) Ventilate</b> <b>@+3:45 Charge Defib</b>
Check Pulse	Pause	AED/Shock
Repeat Additional 0:00 - 4:00		
Consider Termination of Resuscitation per Guideline Or Transport to nearest appropriate facility		
<b>*Note:</b> If Provider 2 is not trained to perform the designated interventions, the Lead Provider should coordinate the transition of CPR duties (utilizing a <b>Third Provider**</b> when available) to ensure interventions are completed within the designated time frame.		

**Step 1: Identify, Announce and Acknowledge Arrest**

1. In any situation where a patient has a decreased level of consciousness, the highest credentialed provider (Lead Provider/Provider #1) should immediately approach and assess breathing and identify pulse/no-pulse.
2. If no pulse is felt, the Lead Provider should immediately begin CPR (themselves) and announce to the other providers that the patient has no pulse.
3. The other providers should acknowledge #1 and begin preparing the scene, patient and equipment for use per this guideline.

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**Step 2: Cycle ONE -- Pads/Monitor & BIAD/O<sub>2</sub>**

2 Person Procedure		
Lead Provider		Provider 2
AEMT (BLS), or Paramedic (ALS)	Time	MFR, EMT, or AEMT
Identify "No Pulse" & Start CPR	0:00 - 2:00  Goal: AED/Monitor & Airway/O <sub>2</sub>	(1) <b>AED/Monitor</b> : place by head (2) <b>Defib Pads</b> : place and attach to AED/Monitor (3) <b>Place BIAD</b> and attach Ambu Bag (4) <i>Ventilate as able</i> @1:45 Charge Defib
Check Pulse	Pause (10 sec max)	AED/Shock

1. Continue CPR, rotating providers every 2 minutes.
  - a. **Do not interrupt compressions unless absolutely necessary.**
  - b. Pause for a maximum of 10 seconds after each rotation (2 minutes) to check for a pulse, evaluate rhythm and defibrillate the patient if needed.
  - c. **Provider #3:** If there is a Third Provider available, they should
    - i. Take over CPR responsibility from Provider #1 after the first rotation.
    - ii. Assist with preparation of the scene, equipment and medications.
2. While continuous CPR is being performed, the other crew member(s) prepare and perform the following interventions:
  - a. 1st minute: Place the AED/monitor by the patients head, in arms reach of both providers. **Attach the defibrillation pads to the patient** and hook them to the AED (BLS) or monitor/defibrillator (ALS).
    - i. *Critical Thinking*: CPR should not be stopped to place the pads. They should be placed on the Right Anterior and the Left Lateral chest wall.
  - b. 2nd minute: **Place a BIAD**, attach a BVM and ventilate the patient with high-flow O<sub>2</sub>.
    - i. *Critical thinking*: In witnessed arrests, the patients blood should be saturated with enough oxygen to last for several minutes. In unwitnessed arrests (or those with a respiratory/hypoxic arrest OR downtime prior to EMS arrival) the oxygen

- has likely been depleted. In either case, the BIAD should be placed and attached to an ambu-bag with high-flow O<sub>2</sub> attached.
- ii. *Alternative #1*: attach high flow O<sub>2</sub> directly to the iGel oxygenation port (*if applicable*).
  - iii. *Alternative #2*: place non-rebreather mask on the patient with high-flow O<sub>2</sub>. This is not preferred, however as the NRB/O<sub>2</sub> setup likely takes the same amount of time as a BIAD/O<sub>2</sub> setup. Also, if a NRB is placed, a BIAD still must be placed later.
- c. **ALS** (with Monitor/Defibrillator): Provider #1 should charge the defibrillator 15 seconds before the planned pause to ensure minimal interruptions of chest compressions.



If Provider 2 is not trained to perform the designated interventions, the Lead Provider (#1) should coordinate available resources to take over CPR duties allowing the Lead Provider to complete the designated interventions within the required time frame.

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**Step 3: Pause ONE** -- 10-second Pause. Minimize time without CPR

1. Provider #2 (the provider managing the monitor) should both charge the defibrillator and place a hand on the carotid or femoral artery to monitor pulse PRIOR TO pausing CPR.
2. The cardiac rhythm and pulse should be assessed simultaneously and Provider #2 should push the “Shock” button as instructed.
3. Provider #1 should restart CPR **immediately** after defibrillation.

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**Step 4: Cycle TWO -- IO Placement, Fluids and Meds**

2 Person Procedure		
Lead Provider		Provider 2
AEMT (BLS), or Paramedic (ALS)	Time	MFR, EMT, or AEMT
(1) Place IO & start NS Bolus (2) Ventilate (ALS) Epinephrine #1 @3:45 Charge Defib	2:00-4:00  Goal: IO/Meds	CPR
Check Pulse	Pause	AED/Shock
Place Mechanical CPR Device (if available)		

1. 3rd & 4th minutes: Simple...continue CPR, place an IO and start IV fluids.
  - a. **ALS**: Give 1st dose of Epinephrine.
  - b. *Critical thinking*: A peripheral IV may be attempted if an obvious access point is easily accessible. If the first attempt fails, immediately place an IO. Once access is established and fluids and meds are infusing, additional peripheral access points can be placed.

**Step 5: Pause TWO**

1. Same as Pause ONE.
2. If Mechanical CPR Device (i.e. Lucas) is available, place it!

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### Step 6: Cycle 3 -- Clean-Up!

2 Person Procedure		
Lead Provider		Provider 2
AEMT (BLS), or Paramedic (ALS)	Time	MFR, EMT, or AEMT
CPR**	4:00 - 6:00 Goal: "Clean Up"	(1) Monitors: attach SpO2 and EtCO2 (2) Ventilate as able @+5:45 Charge Defib
Check Pulse	Pause	AED/Shock

1. At this point, patient should be hooked up to the AED/monitor, an airway (BIAD) should be placed with ongoing oxygenation and ventilation, and IO/IV access should be placed with fluids going.
2. 5th & 6th minutes: Place additional monitoring equipment as needed (i.e. Pulse-Oximetry, End-Tidal CO2 monitor, etc.) and verify all prior interventions have been completed.

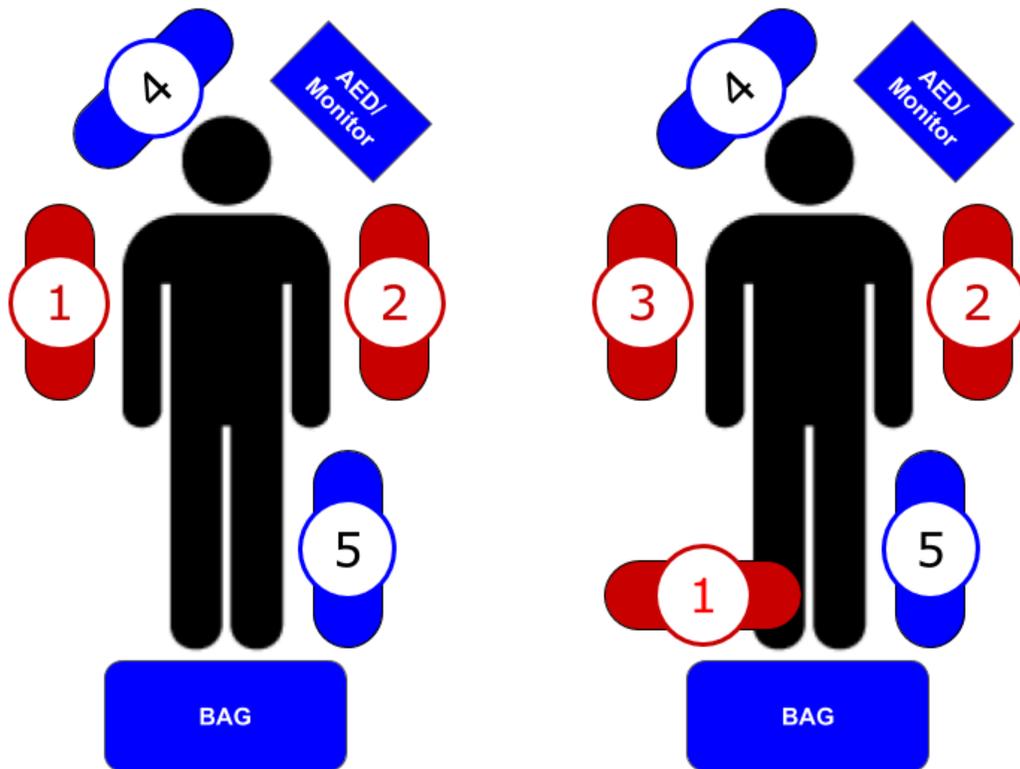
### Step 7: Continue Additional Resuscitation Measures

1. Finally, at this point, the scene and resuscitation should be completely setup.
2. 7th minute onwards:
  - a. Continue CPR and ventilations.
  - b. Provide ACLS drugs per rhythm-specific guideline.
    - i. Max: 3 doses of Epinephrine
    - ii. Max: 2 doses of Amiodarone/Lidocaine
  - c. Assess other causes or necessary treatments for arrest.
  - d. Contact Online Medical Control with questions or for further direction.
3. Consider termination or transport as appropriate after 20-30 minutes of resuscitation on scene per the Termination of Resuscitation Guideline [X-02].

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First Responder						
EMT						
AEMT						
Paramedic						

## Four Provider High-Performance CPR Model

\*\*\*See Table below for condensed guideline\*\*\*



### Overview of 4-Person Pit-Crew CPR

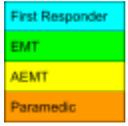
- The 4-Person model is essentially the same as the 2-Person Model in function. Provider #4 and Provider #5 simply offload the Airway and Medication responsibilities from Provider #1 and Provider #2.
- This model is based around the expectation of the Fire/BLS crew arriving first on scene, followed by the transport EMS/ALS crew arriving on average 4 minutes later.
- The First Crew on scene (Fire or EMS) will begin resuscitation based on the 2-Person Model as described.



- Once the 2nd Crew arrives, the ALS EMS crew will take over the responsibilities as described above.
  - The Fire Crew will default to the Provider 1 & Provider 2 positions (and Provider 3 if applicable).
  - The ALS EMS crew will default to Position 4 & Position 5.
- The BLS interventions may (and often should) be done prior to the ALS EMS Crew's arrival.

### Responsibilities of each Provider:

- Provider 1: As with the 2-Person Model, the highest-credentialed provider of the First Crew takes the responsibility of the Lead Provider the resuscitation. This includes:
  - Timing and maintaining the flow of the resuscitation.
  - Ensuring continuous, uninterrupted and effective CPR is being done.
  - Checking for pulse and re-initiating CPR.
  - Making sure the individual roles are assigned and being performed.
  - If a fifth provider (Provider #3) is not present, Provider 1 will alternate with Provider #2 to perform CPR.
  - *Note:* In the event of no ALS crew on scene, Provider 1 maintains the same responsibilities as in the 2-Person Model.
- Provider 2: Similar to the 2-Person Model, Provider #2 is responsible for CPR, including:
  - Retrieving the AED (BLS) or Monitor/Defibrillator (ALS) and placing it by the patients head.
  - Applying the Defibrillation Pads to the patient and hooking them to the AED/Monitor.
  - Providing continuous, high-quality CPR, alternating with Provider #1 (or Provider #3 when available).
  - When time permits, placing the patient on additional monitoring equipment as available, including SpO<sub>2</sub> and EtCO<sub>2</sub> monitors.
  - Assisting the other providers in preparing equipment and medications as needed.
  - *Note:* In the event of no ALS crew on scene, Provider 2 maintains the same responsibilities as in the 2-Person Model.
- Provider 3: If there is a third qualified provider on scene (such as a third member of the Fire Crew or an additional qualified provider), they are responsible for CPR, including:
  - Taking the place of Provider #1 (after the First Cycle) and providing continuous, high-quality CPR, alternating with Provider #2.
  - Assisting the other providers in preparing equipment and medications as needed.



- Provider 4: Once the Transporting ALS EMS Crew is on scene, Provider #4 is the lower-credentialed of the two crew members (generally an EMT or AEMT). They are responsible for Airway Management, including:
  - Placement of a BIAD (iGel, KingLT or Combitube) as soon as possible.
  - Providing continuous airway monitoring, ventilations via a BVM or the BIAD, and suctioning as needed.
- Provider 5: In a joint team resuscitation, Provider #5 is the highest-credentialed EMS provider on the transport crew. They are responsible for:
  - Ensuring appropriate interventions have been done and verifying their effectiveness.
  - Providing IO or additional IV access.
  - Providing medications and other ALS interventions as dictated by appropriate ACLS, PALS or ITLS/PHTLS Guideline, or as published in these Clinical Guidelines.
  - Providing Critical Decision Making and general oversight of the resuscitation, directing or performing additional evaluation and treatment modalities as needed.
  - Determining the need and appropriateness of Transport or Termination of Resuscitation procedures as dictated by the situation.
  - Contacting Online Medical Control as needed.
  - Documenting the resuscitation including times, interventions and the results of those interventions.

Note: Provider #1 and Provider #5 should work in unison to direct and monitor the resuscitation.

- Provider #1 (Fire) is the Lead “Technician” of the resuscitation. They are responsible for the logistics and flow of the resuscitation. This means making sure who and what is needed is appropriately available and utilized. They are also responsible for appropriate timing of the cycles and pauses of the resuscitation.
- Provider #5 (EMS) is the Lead “Clinician”. They are responsible for the overall clinical evaluation of the patient. They are responsible for using critical thinking skills to make clinical decisions (assessments and interventions) that are different or additional to those in the guideline (e.g. alternative airways, alternative transport, additional procedures, etc.).

The Crews on scene may delegate individual providers to a position different than is stipulated in this guideline if the situation warrants it, AND

- The interventions provided by that position are in the provider’s scope of practice.
- There is no interruption or delay of an intervention or any other compromise of the resuscitation.

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4+ Person Procedure					
Provider 4	Provider 1	Time	Provider 2	Provider 3	Provider 5
IV/Med/Doc	Lead/Timer			CPR/Monitor	CPR/Lucas
EMS Paramedic	AEMT or Paramedic (Lead)		MFR, EMT, or AEMT	MFR #2 (if available)	EMS EMT or AEMT
	Identify "No Pulse" & Start CPR	0:00 - 2:00  Goal: AED/Monitor & Airway/O2	(1) AED/Monitor (2) Defib Pads: place and attach to AED/Monitor (3) BIAD/Ambu Bag (4) Ventilate as able @1:45 Charge Defib		(1) Place BIAD (2) Attach to 100% O2 and Ambu Bag (3) Ventilate as able
	Check Pulse	Pause (10 sec max)	AED/Shock		
(1) Place IO (2) NS Bolus (3) Epinephrine #1	(1) IO (2) NS Bolus (3) Ventilate (ALS) Epinephrine #1 @3:45 Charge Defib	2:00-4:00  Goal: IO/Meds	CPR		(1) Ventilate
	Check Pulse	Pause	AED/Shock		
Place Mechanical CPR Device (if available)					
Prep Meds	CPR	4:00 - 6:00 Goal: "Clean Up"	(1) Monitors: SpO2 & EtCO2 (2) Ventilate as able @+5:45 Charge Defib	CPR	(1) Ventilate
	Check Pulse	Pause	AED/Shock		
Continue Additional Resuscitation and Repeat as Necessary					
(ALS) Epinephrine (ALS) Amio/Lido	(1) Ventilate (ALS) Epinephrine (ALS) Amio/Lido @+1:45 Charge Defib	Additional 0:00 - 2:00	CPR		(1) Ventilate
	Check Pulse	Pause	AED/Shock		
	CPR	Additional 2:00 - 4:00	(1) Ventilate @+3:45 Charge Defib	CPR	(1) Ventilate
	Check Pulse	Pause	AED/Shock		
Repeat Additional 0:00 - 4:00					
After 20-30 minutes of Resuscitation, Consider Termination of Resuscitation per Guideline, or Transport to nearest appropriate facility					