



High Performance CPR Update

As part of our ongoing Quality Assurance in Cardiac Arrest incidents, Skagit County EMS under the direction of Dr. Don Slack, MPD is making changes to the way that ALS and BLS providers perform CPR.

Overview: CPR quality has a dramatic impact on pt survival when done according to these guidelines. Minimal breaks in compressions, full chest recoil, adequate compression depth and adequate compression rate are all components of CPR that an increase survival from sudden cardiac arrest. Together these components go together to create High Performance CPR (HP CPR).

Roles: As a rule for the unconscious, unresponsive, pulseless patient the **FIRST** person to the patient starts compressions. **SECOND** person does defibrillation (If there are only 2 responders to begin with, ventilations should begin after the rhythm analysis and shock if indicated). **THIRD** person should start ventilating the patient, placing a King Airway as soon as is practical. **A timekeeper needs to be assigned to ensure high quality CPR, minimal interruption and help track the ALS interventions.**

Principles of HP CPR

1. **EMT's own CPR!!**
2. Minimize interruption in CPR *at all times*, use a timekeeper
3. Ensure proper depth of compressions (>2 inches)
4. Ensure full chest recoil/decompression
5. Ensure proper chest compression rate (100-120/min)
6. Rotate compressors at least every 2 minutes
7. Do not interrupt compressions to ventilate patient, even if an advanced airway is not placed
8. Hands off the chest only during analysis and shock delivery, hover hands over chest during shock delivery and be ready to resume compressions
9. All invasive skills to be done during ongoing CPR
10. Coordination and teamwork between EMT's and Paramedics

EMT's own CPR- EMT's first on scene need to take responsibility for or "**OWN**" the CPR portion of the resuscitation. When Paramedics arrive they will perform the advanced life support measures of the resuscitation and work in coordination with ongoing CPR. The goal is for additional resuscitation care such as defibrillation, medications, or airway management to compliment CPR. CPR should be the default action at all times.

The priority of the resuscitation team needs to be HP CPR. The EMT needs to provide CPR with the appreciation that it is their primary responsibility. Even though the EMT is providing CPR, Paramedic's need to recognize its critical importance and work to integrate ALS care in a way that enables the EMT to achieve consistent CPR. The partnership between EMT's and Paramedic's will provide the basis to achieve HP CPR and in turn improve the chances of successful resuscitation.

Minimize interruption in CPR at all times- longer pauses in chest compressions=lower chances of positive outcomes. The longer the pause preceding the shock or following the shock, the lower the chances of survival. Whenever possible there should be an EMT assigned to keeping time. This person will have a stop watch and will have the responsibility of timing CPR intervals, giving warnings prior to analysis/defibrillation and keeping track of time and reason when compressions are not performed. The time keeper will also be responsible for monitoring quality of compressions and rate.

Ensure proper depth of compressions (>2 inches)-

Better compressions lead to better organ perfusion which leads to better resuscitation. Greater depth of compressions=increased likelihood of a successful shock.

Compression=Organ perfusion

Decompression=Heart perfusion

Ensure full chest recoil/decompression- If decompression is incomplete, compression is not as effective due to inadequate blood volume in the heart and lungs.

Yannopoulos et al. showed that 75% decompression (rather than 100% decompression) does not provide sufficient coronary or cerebral perfusion pressures to achieve ROSC.

Inadequate decompression compromises both coronary *and* cerebral blood flow

Even limited periods of incomplete decompression can have a lingering effect on coronary and cerebral perfusion pressures, which may remain low even after this deficiency in CPR has been corrected.

Ensure proper chest compression rate (100-120/min)- use of a metronome set at 110 bpm will give you a good rhythm to use.

Rotate compressors every 2 minutes- This is something that we as providers need to be diligent about. Perceived performance does not always match observed performance. The likelihood of ROSC increases significantly with higher mean chest compression rate (in a hospital study 75% of patients achieved ROSC with 90 or more chest compressions/minute compared to only 42% with 72 or fewer chest compressions/minute).

Do not pause compressions to ventilate patient, even if an advanced airway is not placed- The emphasis needs to be on continuous CPR without interruptions, this includes pausing for ventilations. BVM-assisted ventilations should be done asynchronously between compressions until an advanced airway can be placed.

Hands off the chest only during analysis and shock delivery, hover hands over chest during shock delivery and be ready to resume compressions- Interruptions can be greatly minimized during AED operations. Hands should be off the chest only when the AED is analyzing or delivering a shock.

Compressions while the AED is charging, hovering your hands just above the chest during shocks and resuming compressions IMMEDIATELY after the shock is delivered will help provide the best outcomes for our patients.

All invasive skills to be done during ongoing compressions- King Airway, Endotracheal Intubations, IV's and IO's should be done as soon as is practical and always during compressions.

Coordination and teamwork between EMT's and Paramedics- There will be an increased focus on a Team Approach during resuscitations. Promoting better understanding of the BLS and ALS provider roles will help us accomplish this.

Delivering HP CPR-

Compression/Ventilation Ratio	Continuous/every 10 compressions
Stop for ventilations	NO
Rhythm analysis	Every 2 minutes

High Performance CPR Goals

Have a coordinated scene- This is key. Everyone must know their role in the call.

The first person to the side of an unconscious, unresponsive, pulseless patient who is not breathing normally begins CAB by performing a QUICK pulse check for no more than 10 seconds and immediately beginning hard, fast chest compressions.

The second person on scene should begin setting up the AED/Monitor and attach the patches to the patient without interrupting compressions. As soon as the AED/Monitor is attached, perform 30 more compressions then allow the AED to analyze.

The 3rd person should be assisting ventilations via BVM without interrupting compressions. Deliver a quick breath every 10 compressions. At the earliest opportunity, place an appropriate sized King Airway. Once King Airway is placed, check lung sounds without interrupting compressions.

Whenever possible, an EMT will be assigned as a Time Keeper.

Compressions 90% of the time- Primary goal of High Performance CPR is to deliver compressions at a minimum of 90% of the time for a patient is in cardiac arrest. 95% of the time would be optimum. Every effort should be made to minimize interruptions in compressions. There should not be interruption of compressions for skills (including intubation) and minimal interruptions for analysis and defibrillation.

Continuous Compressions – All CPR performed by EMS and fire will be done using continuous compressions with breaths given every 10 compressions – **do not interrupt CPR for breaths**. This is for patients who are intubated or are being ventilated with bag-valve-mask.

Two Minutes Intervals of CPR Between Defibrillation – Following defibrillation, perform compressions for 2 minutes prior to analyzing the rhythm.

Time Keeper with a Stop Watch – Whenever possible there should be an EMT assigned to keeping time. This person will have a stop watch and a metronome (device or phone app) set at 110 bpm and will have the responsibility of timing CPR intervals, giving warnings 30 seconds prior to analysis/defibrillation, ensuring compressors are being rotated at 2 minute intervals and keeping track of time when compressions are not performed. The time keeper will also be responsible for minimizing interruptions in compressions as well as monitoring quality of compressions, rate and ventilations.

Minimal Time Between Stopping CPR and Defibrillation – Studies have demonstrated that defibrillation is most effective when performed as soon as you are safely able to do so after stopping compressions. Manual defibrillators should be pre-charged before stopping to check rhythm. For AED's that charge after analyzing rhythm, CPR should be re-started while the unit is charging and then stopped for the shock.

No Pulse or Rhythm Check Immediately After Defibrillation – CPR should be continued immediately after defibrillation.

Safety – Safety issues will need to be carefully addressed in training and practice. To facilitate rapid defibrillation monitors will be pre-charged while rescuers are doing CPR. Agencies will need to develop procedures such as, no one touches the “shock” button until the patient is cleared or some agencies choose to have the person doing compressions push to shock. Whichever way there needs to be safeguards to assure rescuers are clear and there are no inadvertent shocks.

Transition Between ALS and BLS Crews – Transition will be a important issue. It is very important to maintain intervals of CPR to 2 minutes. Agencies will need to know how long it takes for their defibrillators to be turned on and operationally ready, how long it takes to hook them up or switch from AED to manual defibrillator so decisions can be made on when the correct time is to transition. **Know Your Equipment!!!!**

Skagit County EMS
Cardiac Arrest in Adults and Children >8 years

Begin CAB. If unconscious/unresponsive, pulseless and not breathing normally, begin compressions and attach the AED/Monitor, then complete 30 compressions. Analyze rhythm.

Shock Indicated (VF or pulseless VT)

Deliver single shock then immediately resume chest compressions. Perform 2 minutes of uninterrupted CPR. **Do not delay CPR for pulse or rhythm check.**

No shock indicated

Immediately begin chest compressions. Perform 2 minutes of uninterrupted CPR. **Do not delay CPR for pulse or rhythm check.**

After 2 minutes of CPR, analyze rhythm.
Do not check pulse after analyzing rhythm

Shock Indicated (VF or pulseless VT)

Deliver single shock the immediately resume chest compressions. Perform 2 minutes of uninterrupted CPR. **Do not delay CPR for pulse or rhythm check.**

No shock indicated

Check pulse for no more than 10 seconds
If pulse is present, assess blood pressure, airway and breathing.
If no pulse, 2 minutes of uninterrupted CPR

After 2 minutes of CPR, analyze rhythm.
Do not check pulse after analyzing rhythm

Shock Indicated (VF or pulseless VT)

Deliver single shock the immediately resume chest compressions. Perform 2 minutes of uninterrupted CPR. **Do not delay CPR for pulse or rhythm check.**

No shock indicated

Check pulse for no more than 10 seconds
If pulse is present, assess blood pressure, airway and breathing.
If no pulse, 2 minutes of uninterrupted CPR

After 2 minutes of CPR, analyze rhythm.
Do not check pulse after analyzing rhythm

- A. Each CPR cycle begins with chest compressions (at 100/min minimum, > 2 inches or 1/3 of chest wall height, full recoil). Breaths are given every 10 compressions, without stopping compressions, using a bag/valve mask, king airway or via an endotracheal tube.
- B. If age is **not known** treat as an adult if there is development of axillary hair in males or breast tissue development in females.
- C. For AED units that require charge time after “shock advised”, resume compressions until the unit is ready to deliver a shock.
- D. “Pulse checks” should be done only after the second “no shock advised” or after the paramedic using a manual unit sees an organized rhythm.
- E. CPR should not be interrupted whenever possible including intubation, IV access, etc.
- F. Priorities on initial arrival are chest compressions and defibrillation. If there are only 2 responders to begin with, ventilations should begin after the rhythm analysis and shock if indicated.