

CPR & AED Guidelines

CPR

Effective CPR circulates blood and oxygen to the brain of patients whose heart has stopped and have an otherwise intact circulatory system. CPR alone may be effective in restoring a pulse to patients who have arrested from a primary respiratory problem like near drowning, lightning, or snow avalanche; however, it is not effective with patients who arrest as a result of a traumatic MOI that has caused increased ICP, significant lung damage, or volume shock. Effective CPR may buy a few minutes for rescuers to locate and defibrillate patients who are in arrest due to a heart attack. That said, CPR cannot save or prolong the life of pulseless patients for greater than 20 minutes. In the settings where rapid defibrillation, advanced cardiac life support, and rapid transport to a major hospital are not possible most patients in cardiac arrest will die. It is important that all rescuers understand the limits of CPR and when it is appropriate to start and stop it in both the wilderness and urban environment.

Critical Performance Concepts

- Push hard, push fast
- Allow for complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Avoid excessive ventilation

Chain of Survival

1. Immediate recognition of cardiac arrest and activation of the emergency response system
2. Early CPR with an emphasis on chest compressions
3. Rapid defibrillation
4. Effective advanced life support
5. Integrated post-cardiac arrest care

AED

Biphasic AEDs require less energy and less shocks to convert pulseless cardiac rhythms (ventricular fibrillation or ventricular tachycardia) back to a functioning rhythm and pulse than monophasic AEDs; they are also smaller, lighter, and more robust. Many of the newer biphasic AEDs may be used in light rain or snow and are being carried by SAR teams into the field. That said, studies indicate that the survival rate for both earlier monophasic and the newer biphasic AEDs are similar (April/June 2008 Prehospital Emergency Care). Older models deliver a stacked set of 3 shocks each for a total of nine shocks separated by two minutes of CPR; newer models instruct users to give 5 cycles or 1-2 minutes of CPR between each shocks because blood is not circulating when the heart is not working and CPR has stopped. At most there are three buttons to push on an AED: power, analyze, and shock; some have only two: power and shock; and, many of the new models have a have a single power button. Current protocols require that users avoid touching the patient while the AED is analyzing a rhythm to make sure inadvertent movement on the part of the rescuer does not disrupt the AED. Users should also avoid touching a patient during while the machine is delivering a shock. There must be a good electrical connection between the AED pads and the patient's chest for the AED to function properly; and, many AED are packaged with a safety razor so you can remove hair from a patient's chest to endure good conduction.

When using an AED on a hypothermic patient: With AEDs that display a tracing showing the patient's cardiac activity it is easy to determine if there is functional cardiac activity

means that the patient is in asystole—has a cardiac rhythm which would not benefit from defibrillation, including pulseless electrical activity (PEA) OR it means that the patient HAS a functioning cardiac rhythm. When purchasing an AED for use in a cold environment, consider buying one that displays a tracing.

Treatment of Severe Hypothermia with No Life Signs as per:

State of Alaska Protocols & Wilderness Medical Society Practice Guidelines

- Handle patient very carefully.
- Check for respirations and signs of circulation for at least 60 seconds. If the patient is not breathing and has no signs of circulation, give 3 minutes of ventilation. Recheck for signs of circulation and respiration for a further 60 seconds. If the patient still is not breathing and has no signs of circulation and there are no contraindications (next page), continue ventilations. Start chest compressions only if the patient will not receive definitive care within 3 hours. Current research indicates that the maximum survival time for severely hypothermic patients with no palpable pulse and no respirations is 3 hours.
- Use mouth-to-mouth or mouth-to-mask breathing (or bag-valve-mask (BVM) with oxygen) when giving ventilations. Care must be taken not to hyperventilate the patient as low blood CO₂ levels can reduce the threshold for ventricular fibrillation in the cold heart. When using mouth-to-mouth or mouth-to-mask ventilations to the hypothermic patient, give air in/air out at 12 breaths per minute; with a BVM and oxygen deliver at a rate of 6 breaths per minute.
- If the rescuers are authorized to use an automated external defibrillator and the device states that shocks are indicated, one shock should be delivered. If the core temperature of the patient cannot be determined or is above 86° F (30° C), treat the patient as if normothermic according to AHA guidelines. If the patient's core temperature is below 86° F (30° C), discontinue use of the AED after the initial shock until the patient's core temperature has reached 86° F (30° C). For every degree above 86° F (30° C), the likelihood of successful defibrillation increases.
- If CPR has been provided in conjunction with rewarming techniques for more than 30 minutes without the return of spontaneous pulse or respiration, contact the medical control for recommendations. If contact with a physician is not possible, consider terminating the resuscitation in 60 minutes.
- Follow your local protocols.

Contraindications to starting CPR in the Hypothermic Patient

Rescuers should follow state law and local standing orders. Generally, CPR should not be initiated if the patient:

- has been submerged in cold water for more than 1 hour; patient is dead.
- has a core temperature of less than 50° F (10° C); patient is dead.
- has obvious fatal injuries, e.g. decapitation; patient is dead.
- is frozen, e.g. ice formation in the airway; patient is dead.
- has a chest wall that is so stiff that compressions are impossible; patient is dead.
- rescuers are exhausted or in danger; risk to rescuers outweighs potential survival of patient.
- definitive care is available within three hours; patient may survive with definitive hospital care and CPR may precipitate V-fib or pulseless VT.
- CPR cannot be maintained en route to definitive care.

Avalanche Rescue

1. If a patient is not breathing and has no signs of circulation (after a check for 60 seconds) and burial time is known and estimated to be less than 35 minutes OR unknown, perform CPR for 30 minutes. If an AED is available, follow the American Heart Association Guidelines for normothermic patients.

2. If a patient is not breathing and has no signs of circulation (after a check for 60 seconds) and burial time is estimated to be more than 35 minutes OR unknown:

- If there is no air pocket – do not perform CPR.
- If an air pocket is present, uncertain, or patient is wearing a Avalung (or similar device), perform CPR. If an AED is available, delivering one shock if the patient is in ventricular fibrillation is reasonable. If successful, the patient should be transported immediately to the nearest medical facility. If unsuccessful, and the patient's core temperature is below 86° F (30° C), the patient should immediately be transported to the nearest medical facility without further attempts at defibrillation. For every degree above 86° F (30° C), the likelihood of successful defibrillation increases. If the temperature is above 86° F (30° C), use the American Heart Association Guidelines for normothermic patients. Additional treatment should be determined by medical control.

Cold Water (< 70° F or 21° C) Near Drowning

- Any patient who was submerged and unconscious should be transported to a hospital, even if he or she has regained consciousness.
- If a person has been under water for LESS than one hour or unknown, full resuscitative efforts should be employed. If a person has been under water for MORE than one hour, resuscitation efforts are usually unsuccessful, and should not be started.
- Because severe/profound hypothermia (core temperature below 82° F or 28° C) is uncommon in cold water near drowning, hypothermia is less critical than cardiopulmonary arrest. Rewarming is done to raise the temperature to make defibrillation more effective.
- Drowning have occasionally been successfully resuscitated after prolonged submersion (> 30 minutes) in cold water (< 50° F) but ONLY with ALS intervention. If the patient is not breathing and has no signs of circulation (after a check for 60 seconds), start CPR immediately. If an AED is available, delivering one shock if the patient is in ventricular fibrillation is reasonable. If successful, the patient should be transported immediately to the nearest medical facility. If unsuccessful, and the patient's core temperature is below 86° F (30° C), the patient should immediately be transported to the nearest medical facility without further attempts at defibrillation. For every degree above 86° F (30° C), the likelihood of successful defibrillation increases. If the temperature is above 86° F (30° C), use the American Heart Association Guidelines for normothermic patients. Additional treatment should be determined by medical control.

WMS General Guideline for Stopping CPR in a Wilderness Environment

- After 30 minutes of CPR pulse has not returned.
- Follow your local protocols

Guideline Summary

Maneuver	Adult: adolescent & older	Child: 1 yr to adolescent	Infant: < 1 yr
Call for Help	<ul style="list-style-type: none"> • Patient is V, P, U • After 5 cycles (2 min) of CPR if patient is in arrest from primary respiratory problem (drowning, avalanche, lightning. etc.) 	<ul style="list-style-type: none"> • Patient is V, P, U • After 5 cycles (2 min) of CPR if patient is in arrest 	
Airway	<ul style="list-style-type: none"> • Trauma: jaw thrust; non-trauma: head tilt, chin lift 		
Breathing rate	<ul style="list-style-type: none"> • For a suspected heart attack begin with chest compressions; for a suspected arrest due to a primary respiratory problem (drowning, avalanche, or lightning) begin with 2 rescue breaths. • Once started give air in/air out as chest rises; avoid over inflation. 		
Obstructed Airway	<ul style="list-style-type: none"> • Abdominal thrusts • Chest thrusts with pregnant, obese, and unresponsive patients 	<ul style="list-style-type: none"> • Back slaps and chest thrusts 	
Pulse check	<ul style="list-style-type: none"> • Carotid (limit to 10 seconds) 	<ul style="list-style-type: none"> • Carotid or femoral 	<ul style="list-style-type: none"> • Brachial or femoral
Compression Landmark	<ul style="list-style-type: none"> • Sternum at mid-nipple line 		<ul style="list-style-type: none"> • Just below mid-nipple line
Compression Method	<ul style="list-style-type: none"> • 2 hands 	<ul style="list-style-type: none"> • 1 or 2 hands 	<ul style="list-style-type: none"> • 1 rescuer: 2 fingers • 2 rescuers: circle chest, 2 thumbs
Compression Depth	<ul style="list-style-type: none"> • At least 2 inches 	<ul style="list-style-type: none"> • At least 1/3 of chest depth 	
Compression Rate	<ul style="list-style-type: none"> • At least 100/min 		
Start Compressions	<ul style="list-style-type: none"> • For a suspected heart attack begin with chest compressions; for a suspected arrest due to a primary respiratory problem (drowning, avalanche, or lightning) begin with 2 rescue breaths. 		
Compression to breath ratio	<ul style="list-style-type: none"> • 30 compressions to 2 breaths 	<ul style="list-style-type: none"> • 1 rescuer: 30 compressions to 2 breaths • 2 rescuer: 15 compressions to 2 breaths 	
AED	<ul style="list-style-type: none"> • May be used on adults, children, & infants 		
AED pads	<ul style="list-style-type: none"> • Adult pads only 	<ul style="list-style-type: none"> • Child pads preferred; use adult pads if child pads are unavailable 	
AED & CPR	<ul style="list-style-type: none"> • If witnessed sudden collapse use AED ASAP • 5 cycles of CPR first if response is greater than 4-5 min • Alternate shocks with 5 cycles of CPR for a maximum of 3 shocks • With 2 rescuers: alternate position every 2 minutes between chest compressions and rescue breathing • Follow AED instructions & local protocols 		
Advanced Airway	<ul style="list-style-type: none"> • If an advanced airway is in place chest compressions can be continuous with a rescue breath given every 6-8 seconds (8-10 per minute) 		
STOP Resuscitation: Urban Context	Before transport; all must apply: <ul style="list-style-type: none"> • Unwitnessed arrest • No pulse after three complete rounds of CPR and AED analyses • No AED shocks delivered 		
STOP Resuscitation: Wilderness Context	<ul style="list-style-type: none"> • After 20-30 minutes of pulselessness • Follow local protocols for hypothermic patients 		