

Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care

Emergency Cardiac Care Committee
and Subcommittees, American Heart Association.

Emergency Cardiac Care Committee

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HYPOTHERMIA

Severe accidental hypothermia (body temperature below 30° C (86° F)) is associated with marked depression of cerebral blood flow and oxygen requirement, reduced cardiac output, and decreased arterial pressure. Victims can appear to be clinically dead because of marked depression of brain and cardiovascular function, but full resuscitation with intact neurological recovery is possible, although unusual. The victim's peripheral pulses and respiratory efforts may be difficult to detect, but lifesaving procedures should not be withheld based on clinical presentation.

Basic Life Support

If the victim is not breathing, rescue breathing should be initiated. Cardiopulmonary resuscitation (CPR) in the pulse-less patient should be begun immediately, although pulse and respirations may need to be checked for longer periods to detect minimal cardiopulmonary efforts. The traditional recommendation that pulse and respirations be checked for 1 to 2 minutes before beginning CPR is probably excessive. A span of 30 to 45 seconds should be adequate to confirm pulselessness or profound bradycardia, for which CPR would be required. It is important to prevent further heat loss from the patient's body core by removing wet garments from the victim, insulating the victim, shielding him or her from wind, and ventilating with warm, humidified oxygen. For victims not in cardiac arrest with temperatures of 30° C to 34° C (86° F to 93° F), apply external-warming devices to truncal areas only (warm packs to neck, armpits, and groin). After stabilization, cautiously ready the patient for transport to a hospital.

Treatment of severe hypothermia (temperature less than 30° C (86° F) in the field remains controversial.

Many providers do not have the equipment or time to adequately assess core body temperature or to institute rewarming with warm, humidified oxygen or warm fluids, although these methods should be initiated when available to help prevent temperature afterdrop.

Cardiac monitoring and intravenous access should be rapidly established if possible, and core temperature should be determined in the field with either tympanic membrane sensors or rectal probes, but none of these should delay transfer. Airway management and transportation should be undertaken as gently as possible to avoid precipitating ventricular fibrillation (VF). The patient should be moved in the horizontal position to avoid aggravating hypotension through orthostatic mechanisms.

If the hypothermic victim is in cardiac arrest, the treatment algorithm in Fig 2 should be followed. If VF is detected, emergency personnel should deliver three shocks to determine fibrillation responsiveness. If VF persists after three shocks, further shocks should be avoided until after rewarming to above 30° C (86° F). CPR, rewarming, and rapid transport should immediately follow the three defibrillation attempts. If core temperature is below 30° C (86° F), successful defibrillation may not be possible until rewarming is accomplished.

Figure below presents a recommended hypothermia treatment algorithm, with recommended actions that should be taken for all possible victims of hypothermia.

Advanced Cardiac Life Support

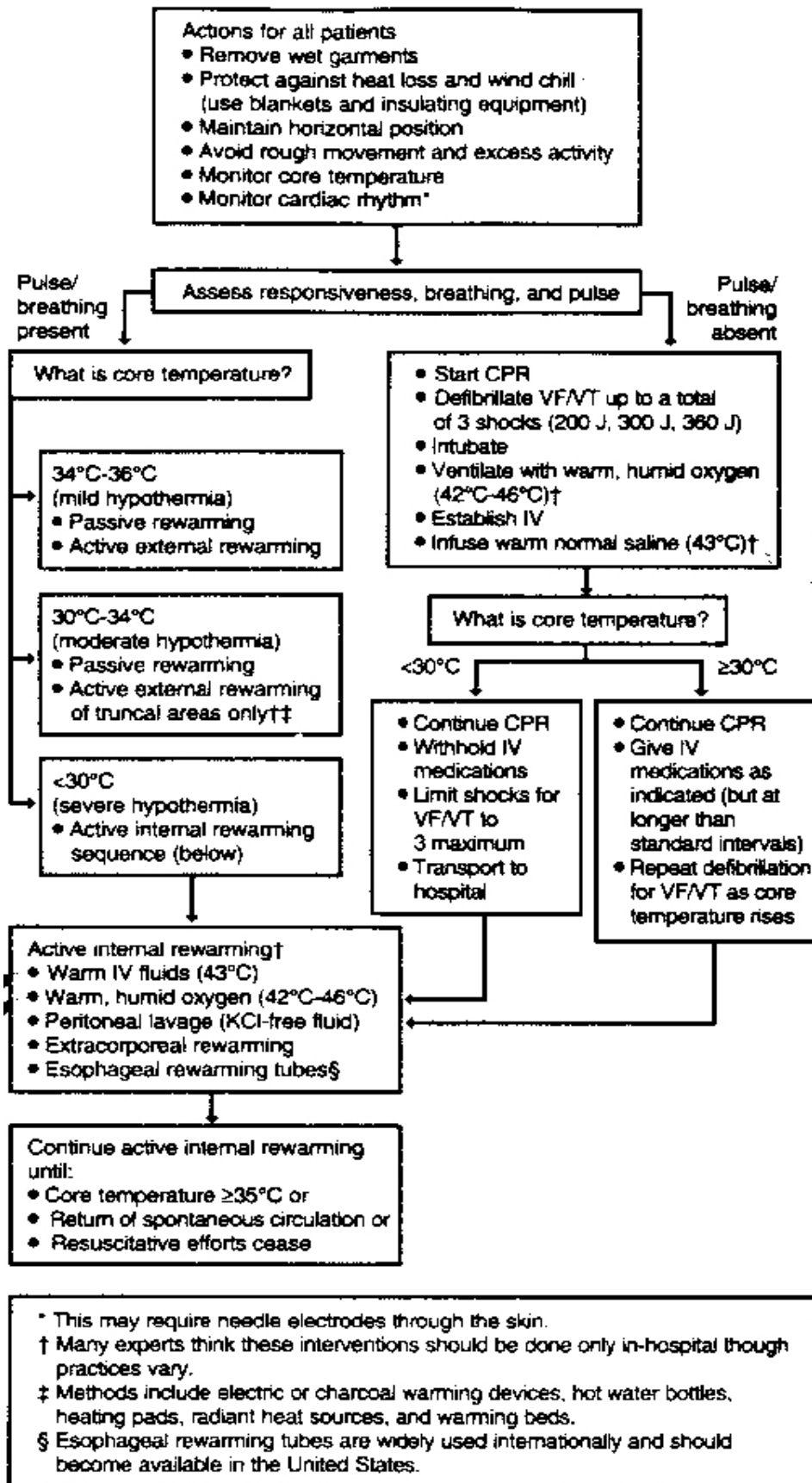
In the hypothermic victim who has not yet developed cardiac arrest, many physical manipulations (including endotracheal or nasogastric intubation, temporary pacemaker, or pulmonary artery catheter insertion) have been reported to precipitate VF. However, when specifically and urgently indicated, such procedures should not be withheld. In a prospective multicenter study of hypothermia victims, careful endotracheal intubation did not result in a single incident of VF. Endotracheal intubation to provide effective ventilation with warm, humidified oxygen

(see: www.hypothermia-ca.com/res-q-air.htm) and to prevent aspiration should be performed in the unconscious hypothermic patient with inadequate ventilation. In such cases, prior ventilation with 100% oxygen via bag-valve mask is recommended.

Conscious victims who are cold with only mild symptoms of hypothermia may be rewarmed with external active and passive rewarming techniques (e.g., warm packs, warmed sleeping bags, and warm baths).

Management of cardiac arrest due to hypothermia is quite different from management of normothermic arrest. The hypothermic heart may be unresponsive to cardioactive drugs, pacemaker stimulation, and defibrillation, and drug metabolism is reduced. Administered medications, including epinephrine, lidocaine, and procainamide, can accumulate to toxic levels if used repeatedly in the severely hypothermic victim.

Active core rewarming techniques are the primary therapeutic modality in hypothermia victims in cardiac arrest or unconscious with a slow heart rate.



(Fig 1 above) Algorithm for treatment of hypothermia.

If the patient fails to respond to initial defibrillation attempts or initial drug therapy, subsequent defibrillation's or additional boluses of medication should be avoided until the core temperature rises above 30° C (86° F). Bradycardia may be physiological in severe hypothermia, and cardiac pacing is usually not indicated unless bradycardia persists after rewarming. The temperature at which defibrillation should first be attempted and how often it should be tried in the severely hypothermic patient have not been firmly established. There are also conflicting reports about the efficacy of bretylium tosylate in this setting, although it may prove helpful in VF by raising the fibrillation threshold.

Treatment of severely hypothermic victims in cardiac arrest in the hospital setting should be directed at rapid core rewarming. Techniques that can be used include the administration of heated, humidified oxygen (42° C to 46° C (108.7 to 115° F), warmed intravenous fluids (normal saline) at 43° C (109° F) infused centrally at rates of approximately 150 to 200 mL/h (to avoid overhydration), (see: <http://www.hypothermia-ca.com/IV-warmer.html>) peritoneal lavage with warmed (43° C [109° F]) potassium-free fluid administered 2 L at a time, or extracorporeal blood warming with partial bypass. The use of esophageal rewarming tubes in the United States has not yet been reported, although they have been used extensively in Europe. Pleural lavage with warm saline instilled through a chest tube has also been used successfully. The routine administration of steroids, barbiturates, or antibiotics has not been documented to help increase survival or decrease postresuscitative damage.

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