

## **HYPOTHERMIA**

Hypothermia is defined as having a core temperature less than 35°C (95°F). Populations most at risk are the elderly, children, in particular newborns, trauma victims, individuals with physical disabilities or chronic illness, involvement in cold weather recreation and use of drugs and alcohol. As core temperature falls below 37°C shivering increases to increase the metabolic rate. These complex responses are regulated by centers in the hypothalamus. As core temperature falls further (32° to 24°C) the basal metabolic rate begins to drop and shivering is extinguished. With profound hypothermia (below 24°C) the individual's ability to conserve heat is eliminated and ultimately ends in death. Most commercial oral thermometers do not go below 34.4 C, thus if hypothermia is suspected use rectal or esophageal methods to measure core temperatures.



## **CLINICAL MANIFESTATIONS**

Identifying the clinical features of hypothermia may be easy when the history is suggestive.

Symptoms of early hypothermia may be subtle and nonspecific.

- Mild hypothermia may display nausea, dizziness, chills, confusion, moodiness, poor coordination, apathy, and tachycardia.
- Moderate hypothermia 32°C, (89.6°F) to 29°C, (85.2°F) is characterized by worsening mental status, atrial fibrillation or other dysrhythmia, decreasing pulse and respiration, abnormal reflexes, and pupillary dilation. Sinus bradycardia, atrial flutter or fibrillation are well tolerated and revert when rewarming occurs.
- Severe hypothermia 28°C, (82.4°F) to 22°C, (71.6°F) is characterized by an increased risk of lethal arrhythmias (ventricular fibrillation), further decrease in pulse and respiration, severe acid-base disturbance and hypotension. Defibrillation of v-fib although necessary may not prove successful until the patient is warmed.
- Profound hypothermia (below 20°C, 68°F) the EEG flattens and asystole develops. Because severe hypothermia “mimics death,” patients should be warmed and declared dead after “failure to revive after rewarming.”

## **EMS & HOSPITAL MANAGEMENT**

Management of the hypothermic patient involves general support measures involving airway, breathing, and circulation and specific rewarming techniques. Patients may be rewarmed actively or passively. The degree of hypothermia forms the basis of management:

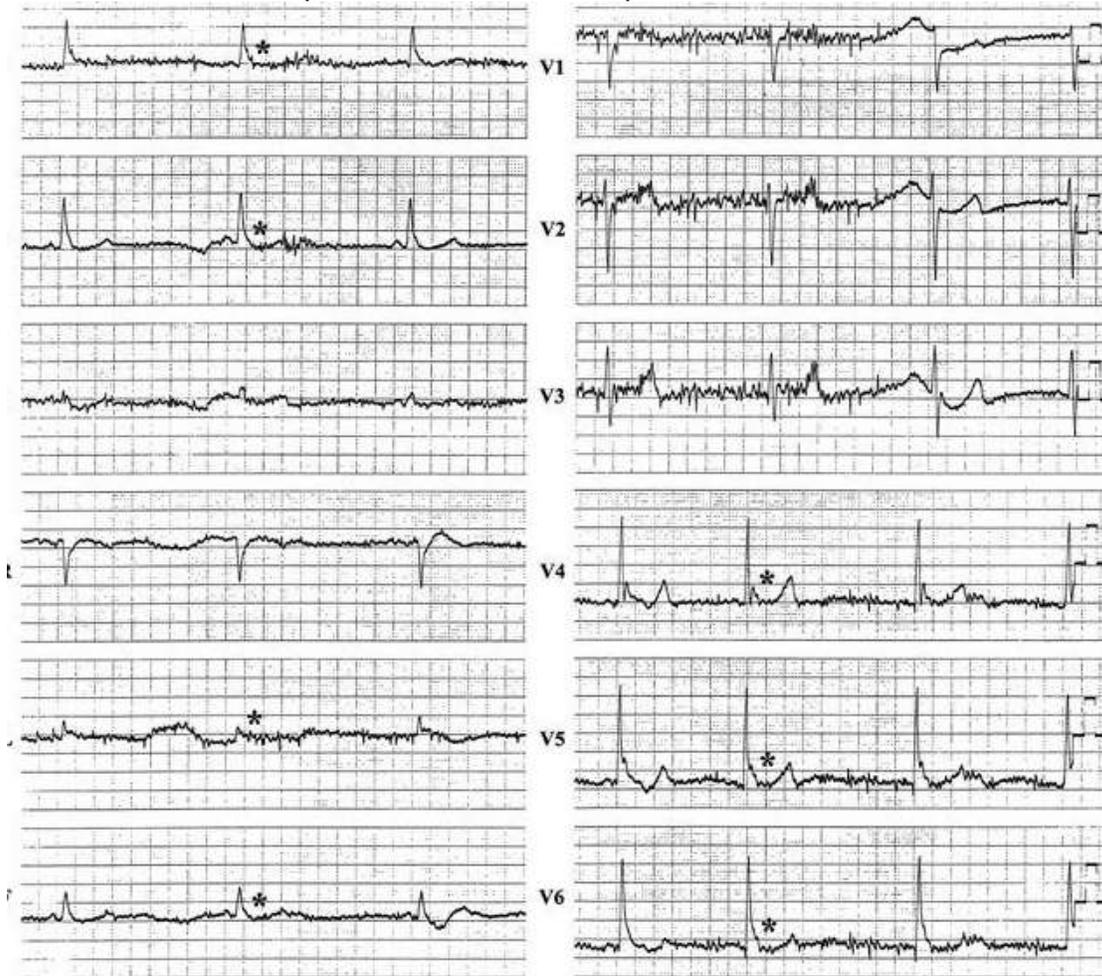
- Passive rewarming methods include: removal of wet clothing, use of heated blankets, and use of hot water bottles.
- Active rewarming may include: warmed IVF and warmed humidified gases.
- Rapid rewarming techniques may include: peritoneal lavage, thoracotomy with mediastinal lavage or cardiopulmonary bypass.

- Please refer to your institution's rewarming policy regarding clinical pathways for hypothermia.

#### CARDIAC INJURY

- The hypothermic myocardium is particularly susceptible to ventricular dysrhythmias that are refractory to treatment. Efforts should be made to limit cardiac stimulation (e.g. use of intracardiac catheters). Management includes aggressive rewarming techniques and limited attempts at pharmacologic and electrical cardioversion.

Osborn J Wave also known as J waves, camel-hump waves, and hypothermic waves – 2nd bump in terminal QRS complex\*



#### SOFT TISSUE INJURY

- Frostbite occurs when tissue temperature drops below 0°C. The extremities, nose, ears, and penis are commonly affected. First degree frostbite involves the superficial dermis. Second degree frostbite involves the deep epidermis. Frostbite commonly presents with numbness and tingling and appears mottled or grey. After rapid rewarming of the tissue in a warm water bath (37° to 40°C) it

may become extremely painful and hyperemic. Mummification of tissue may occur in the severest of cases. Further management involves, analgesia and debridement.