



## SPECIAL ARTICLE

# Management of severe accidental hypothermia<sup>☆</sup>

M.L. Avellanas<sup>a,\*</sup>, A. Ricart<sup>b</sup>, J. Botella<sup>c</sup>, F. Mengelle<sup>d</sup>, I. Soteras<sup>e</sup>, T. Veres<sup>f</sup>, M. Vidal<sup>g</sup>

<sup>a</sup> Unidad de Medicina Intensiva, Hospital General, San Jorge, Huesca, Spain

<sup>b</sup> Servicio de Medicina Intensiva, Hospital Universitario de Bellvitge, l'Hospitalet de Llobregat, Barcelona, Spain

<sup>c</sup> Unidad de Medicina Intensiva, Hospital Universitario La Fe, Valencia, Spain

<sup>d</sup> SAMU 31, CHU Purpan, Toulouse, France

<sup>e</sup> Servicio de Urgencias, Hospital de Puigcerdà, Puigcerdà, Spain

<sup>f</sup> Servicio de Cirugía, Hospital de Puigcerdà, Puigcerdà, Spain

<sup>g</sup> Grupo de Emergències Mèdiques de la DGPEIS, Bombers Generalitat de Catalunya, Barcelona, Spain

Received 18 November 2011; accepted 2 December 2011

### KEYWORDS

Accidental hypothermia;  
Classification of hypothermia;  
Cardiac arrest;  
Cardiopulmonary resuscitation;  
Rewarming;  
Afterdrop

### PALABRAS CLAVE

Hipotermia accidental;  
Clasificación hipotermia;  
Parada cardíaca;  
Reanimación cardiopulmonar;

**Abstract** Accidental hypothermia is an environmental condition with basic principles of classification and resuscitation that apply to mountain, sea or urban scenarios. Along with coagulopathy and acidosis, hypothermia belongs to the lethal triad of trauma victims requiring critical care. A customized healthcare chain is involved in its management, extending from on site assistance to intensive care, cardiac surgery and/or the extracorporeal circulation protocols.

A good classification of the degree of hypothermia preceding admission contributes to improve management and avoids inappropriate referrals between hospitals. The most important issue is to admit hypothermia victims in asystolia or ventricular fibrillation to those hospitals equipped with the medical technology which these special clinical scenarios require.

This study attempts to establish the foundations for optimum management of accidental hypothermia from first emergency care on site to treatment in hospital including, resuscitation and rewarming with extracorporeal circulation.

© 2011 Elsevier España, S.L. and SEMICYUC. All rights reserved.

### Manejo de la hipotermia accidental severa

**Resumen** La hipotermia accidental es una patología ambiental con unos principios básicos de clasificación y reanimación que sirven tanto para el medio montañoso, marítimo o urbano. Esta patología ha formado parte, junto a la acidosis y la coagulopatía, de la famosa «tríada letal» de las víctimas traumáticas en situación crítica. En su manejo y asistencia está implicada toda una cadena asistencial que se extiende desde la medicina de urgencia prehospitalaria hasta la medicina intensiva, llegando incluso hasta la cirugía cardíaca y/o a los programas de circulación extracorpórea.

<sup>☆</sup> Please cite this article as: Avellanas ML, et al. Manejo de la hipotermia accidental severa. Med Intensiva. 2012;36:200–12.

\* Corresponding author.

E-mail address: mlavellanas@ono.com (M.L. Avellanas).

### Recalentamiento; Efecto de recaída

Una buena clasificación prehospitalaria del grado de hipotermia facilitará su manejo inicial y evitará traslados interhospitalarios o secundarios innecesarios. Lo fundamental es trasladar, con la mayor urgencia posible, a las víctimas hipotérmicas en asistolia o fibrilación ventricular hasta aquellos hospitales que tengan la capacidad tecnológica adecuada para el tratamiento de estas especiales situaciones clínicas.

Este artículo, trata de sentar las bases que faciliten un manejo adecuado de la hipotermia accidental desde la primera asistencia prehospitalaria hasta tratamiento final hospitalario, incluyendo la reanimación y el recalentamiento con circulación extracorpórea.

© 2011 Elsevier España, S.L. y SEMICYUC. Todos los derechos reservados.

## Introduction

The management of severe accidental hypothermia is not exclusive of rescue or urgent pre-hospital medicine but can also be extended to Critical Care Medicine and even heart surgery and extracorporeal circulation programs. In the event of accidental hypothermia it is essential to correctly select the victims who might benefit from transfer to a higher level hospital center. Wrong decisions at the time of first aid can subject the patient to long and unnecessary transfer to a hospital that may not have the technology best suited for the management of severe hypothermia. The International Commission for Mountain Emergency Medicine (ICAR MEDDCOM), the International Society for Mountain Medicine and Medical Commission and the International Mountaineering and Climbing Federation (UIAA MEDDCOM) have published consensus guides for the classification and pre-hospital management of severe hypothermia victims secondary to mountaineering accidents.<sup>1</sup> The basic principles for the classification, resuscitation and management of accidental hypothermia victims are the same in the maritime, mountaineering and urban settings.<sup>2</sup>

## Definition

Hypothermia is defined as a decrease in core body temperature (CBT) to below 35°C. The condition is classified as mild when CBT is between 35 and 32°C, moderate when between 32 and 30°C, and severe when under 30°C. Accidental hypothermia is turn refers to a spontaneous, unintended decrease in CBT generally occurring in a cold environment, associated to an acute problem of some kind, and without prior damage of the hypothalamus, which is where the body thermostat is located.

## Physiopathological alterations (Table 1)

Cold is the clear and fundamental cause of accidental hypothermia, though its pathogenic action depends on the intensity of cold, the duration of exposure, and the environmental conditions. The usual causal situation is immobilizing injury in a cold scenario, cold exposure without adequate protection, or immersion in cold water (Table 1).

Thermoregulation is the balance between heat production (thermogenesis) and heat elimination (thermolysis). This active equilibrium, which keeps body temperature as close as possible to 37°C, allows the enzyme systems to function within a narrow optimum metabolic window or margin. In situations of mild hypothermia, the

thermoregulatory mechanisms operate at a maximum in an attempt to combat heat loss, with trembling (shivering), cutaneous vasoconstriction, diminished peripheral perfusion, increased cerebral blood flow, increased diuresis (cold diuresis), increased heart rate, increased respiratory rate, increased cardiac output and increased blood pressure. If the condition of the victim worsens and the CBT drops to below 30–32°C, enzymatic activity is slowed, the capacity to generate heat decreases, the thermoregulatory system becomes exhausted, the functions of different body organs progressively decrease, and death ultimately results due to cardiorespiratory failure.<sup>3–7</sup>

Of the physiopathological alterations reflected in Table 1, four are particularly relevant:

- (1) Ventricular fibrillation (VF) and asystolia may occur below a CBT of 28°C. However, some authors consider that asystolia does not usually manifest above 23°C, unless there is some other concomitant cause, and that asystolia presenting before the temperature drops to 23°C implies a poorer prognosis.<sup>8</sup>
- (2) Inadequate patient management, e.g., involving sudden postural changes, can trigger ventricular fibrillation.
- (3) At a temperature of 18°C the brain can tolerate periods of cardiac arrest 10 times longer than at 37°C.<sup>4</sup>
- (4) Oxygen consumption decreases by 6% for every 1°C drop in CBT, and this reduction also affects the central nervous system (CNS) (brain and spinal cord). The decrease in oxygen consumption causes hypothermia to exert a preventive effect upon brain and spinal cord hypoxia, allowing complete neurological recovery after prolonged immersion in icy water, in serious head and spinal cord injury victims, or in cases of cardiorespiratory arrest.<sup>4,9,10</sup>

## Consequences of hypothermia in trauma victims

Until well into the 1980s, the “lethal triad” of hypothermia, acidosis and coagulopathy was considered to be the main cause of mortality in critical trauma patients. Even in urban settings, and logically conditioned to the climate and temperature, when the duration of transport to the nearest hospital is about 15 min, close to 50% of all penetrating injury victims suffer hypothermia upon admission to the emergency room.<sup>11</sup> According to different studies in trauma victims, the mortality rate among hypothermic versus normothermic patients increases up to 50%.<sup>12</sup> Those particularly vulnerable are burn victims, patients with serious head injuries, or individuals with upper spinal cord

Download English Version:

<https://daneshyari.com/en/article/3114335>

Download Persian Version:

<https://daneshyari.com/article/3114335>

[Daneshyari.com](https://daneshyari.com)