Managing accidental hypothermia: progress but still some way to go

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Accidental hypothermia has become much better understood over the last 25 years. Not only is it recognised that it significantly worsens the prognosis if it occurs alongside many medical conditions including major trauma1,2 and elective surgery, but it is also well established that severe accidental hypothermia (core temperature <28°C) is eminently survivable if treated correctly, even in the presence of cardiac arrest.4 In practice, hypothermia can be divided into two groups: mild hypothermia (core temperature 32°−35°C, table 1) and everything else. In the presence of trauma, mild hypothermia starts at 36°C,4 reflecting its deleterious effect on outcome. Mild hypothermia is very common so prehospital and hospital staff will have experience managing it. The condition per se is not lethal and there is a lot of latitude regarding general management and to which hospital a patient is taken. By contrast, severe hypothermia is relatively rare and very unforgiving. There are special requirements for managing the patient with wet clothes, packaging and the use of heat. Above all, the peri-arrest and cardiac arrest situations must be managed differently from the normothermic patient. Moving a patient with severe hypothermia can easily trigger a cardiac arrest or the most appropriate receiving hospital for patients with hypothermia. Although the overall response rate was =60%, the results are nevertheless useful. Clearly, there are not only differences between services but also differences between organisations working within the same service and most importantly, some significant deviation from published best practice in a way that would not be expected in the management of other potentially fatal conditions, for example, cardiac arrest. One reason for the wide range of responses may be because the survey question asked about ‘potentially cold/hypothermic’ casualties. This description is very broad so it is difficult to assess the responses because best management depends on how cold the patient is. Mountain Rescue England and Wales (including Cave Rescue) has had a severe hypothermia protocol since 2014 yet surprisingly, only 81% of mountain rescue team respondents were aware of this. Disappointingly, only one-third of Ground Ambulance services have a protocol. Ideally, protocols should not only describe packaging but should also include important clinical issues such as safe handling of a patient who might have cardiac instability and the management of hypothermic arrest. It is pleasing to see that >91% of the organisations would employ a vapour barrier. This is considered an effective method of reducing heat loss, as moving a patient with severe hypothermia to remove wet clothes can precipitate a cardiac arrest. Precise operational practices will be influenced by differences in work setting, reflecting the ability to transport equipment into remote areas, the need for heat and effective insulation if the patient will remain in a cold environment for some time during evacuation (eg, mountainside or boat compared with a warm land vehicle or aircraft) and the speed of transport to hospital. The most concerning survey results are where practices known to provide suboptimal care are used, for example, measuring temperature by the skin or rectal routes and failure to use external heat to slow cooling.

Clearly, there is still room for improvement. A recent international survey of hypothermia management in mountain rescue also concluded that most teams do not follow standard guidelines for the treatment of severe hypothermia.5 Although the Freeman study could not investigate the reasons underlying the observed divergence from best practice, it is possible to propose some factors that might account for the findings. Accidental hypothermia has been included in the European Resuscitation Council section on Cardiac Arrest in Special Circumstances since 2005, but unlike many other causes of cardiac arrest, a protocol in an easy-to-follow format is not provided. As a result, practitioners have to read the whole section in the published guideline themselves and distill the information into a suitable format for field use. People who are not used to reading medical publications, such as some of the organisations surveyed in the Freeman study, may not feel able to do this work. Historically, some voluntary organisations have not had a clear governance framework because some members feel that having a structured approach is not appropriate for their voluntary status, and they therefore may not employ best-practice guidelines.

The Freeman study is a wake-up call for UK prehospital services and also a reminder for experts that developing guidelines is not sufficient on its own if the frontline carers do not use them. Like everything in medicine, achieving the best outcome depends on practitioners employing the most up-to-date evidence-based approach. Changing attitudes is never straightforward, but making a concise version of the protocols available
in an easy-to-follow format is a simple initiative that could make a difference. Ideally, resuscitation councils should do this work because they have the credibility. A summary of the essential points for accident hypothermia is shown in table 1 based on recent international reviews. Versions should also be available for other groups that could need them, including control room staff who deploy prehospital teams and hospital staff, especially if rewarming will have to be undertaken by non-extracorporeal life support methods. In the absence of a formal guideline, individual organisations have to decide locally how to manage hypothermia, perhaps at short notice, with all the potential for inaccuracy that this approach engenders. An authoritative evidence-based guideline supported by education and the availability of essential equipment is the ideal, as seen with ALS. Without this approach, a repeat of this survey done in 3 years' time will probably find no improvements.

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REFERENCES


Table 1 Staging and treatment of accidental hypothermia in the absence of major trauma (from Brown et al and Paal et al8-10)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Clinical symptoms</th>
<th>Typical core temperature</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild (HT I)</td>
<td>Conscious, shivering</td>
<td>35°C–32°C</td>
<td>Warm environment and clothing; warm sweet drinks and active movement (if possible). Patients with HT I with significant trauma, comorbidities or those suspected of secondary hypothermia should receive HT II treatment.</td>
</tr>
<tr>
<td>Moderate (HT II)</td>
<td>Impaired consciousness* (shivering may have ceased)</td>
<td>&lt;32°C–28°C</td>
<td>Full-body insulation; vapour barrier; active external and minimally invasive rewarming techniques (warm environment; chemical or electrical heating packs or blankets; forced air; warm parenteral fluids). Horizontal position and immobilisation. Core temperature monitoring (not skin or rectal). Minimal and cautious movements to avoid arrhythmias.</td>
</tr>
<tr>
<td>Severe (HT III)</td>
<td>Unconscious*, vital signs present</td>
<td>&lt;28°C</td>
<td>HT II management plus: Airway management as required. Preference to treat in an ECMO/CPB centre, if available, due to the high risk of cardiac arrest. Consider ECMO/CPB in cases with cardiac instability that is refractory to medical management and for patients with comorbidities who are unlikely to tolerate the low cardiac output associated with HT III.</td>
</tr>
<tr>
<td>Severe (HT IV)</td>
<td>Vital signs absent</td>
<td>Cardiac arrest is possible below 32°C. Risk increases substantially below 28°C and continues to increase with ongoing cooling.</td>
<td>Cardiopulmonary resuscitation and up to three doses of epinephrine and defibrillation (further dosing guided by clinical response). Prevent further heat loss (insulation, warm environment; vapour barrier). Airway management. Active external and minimally invasive rewarming (see HT II) during transport is recommended. Do not apply heat to head. Transport to ECMO/CPB.</td>
</tr>
</tbody>
</table>

*Consciousness may be impaired by comorbid illness (ie, trauma, central nervous system pathology, toxic ingestion, etc) independent of core temperature. CPB, cardiopulmonary bypass; ECMO, extracorporeal membrane oxygenation; HT, hypothermia.