CSOP 014 – Severe Hypothermia

Version No: 2.0 Effective date: 11/08/2020

APPROVALS

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Next Review Date:	August 2022		

HISTORY

Effective Date	Version No.	Summary of Amendment
Feb 2017	1.0	Creation of document
April 2020	2.0	Document updated

1. REFERENCES

Document Reference Number	Document Title
1	Advanced Life Support, Resuscitation Council UK
2	IKAR-MEDCOM Hypothermia scale
3	Hypothermia consensus meeting Edinburgh 01/12/14

2. ANNEX/APPENDIX

Document Reference Number	Document Title

3. Purpose

To define the most appropriate pre-hospital management of significant hypothermia (temperature <35 C).

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4. Scope

This SOP applies to any patient who is suspected of having significant hypothermia.

5. Definitions/Acronyms:

Abbreviations/Acronym	Definitions
ECMO	Extra Corporal Membrane Oxygenation
CPB	Cardio-pulmonary bypass
IKAR-MEDCOM	International Commission for Mountain Emergency Medicine
ETT	Endo-tracheal Tube
LMA	Laryngeal Mask Airway

6. Introduction

European and Scandinavian experience has shown that good recoveries can be made from apparently hopeless situations in patients with significant hypothermia. At 18°C the brain can tolerate periods of circulatory arrest for ten times longer than at 37°C. [1]

Patients have made full recoveries after hours of CPR but only with the appropriate care. This can only be achieved with extra-corporal (circulation and warming of blood outside of the body) circulation, either by ECMO or cardio-pulmonary bypass. ECMO is the modality of choice causing less trauma to blood and requiring less anti-coagulation. If a diagnosis of moderate to severe hypothermia is made every effort should be made to refer and directly transport the patient for ECMO. If ECMO is not a viable option then cardio-pulmonary bypass is an effective treatment.

7. Grading the severity of hypothermia

The severity of hypothermia may be defined by the core body temperature:

Mild	35 – 32°C
Moderate	32-28°C
Severe	<28°C

Measuring an accurate core body temperature may be difficult in the pre-hospital environment and therefore the Swiss IKAR – MEDCOM staging of hypothermia is more useful[2]:

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Stage	Clinical findings	Core temperature in °C
1	Conscious, shivering	35 - 32
2	Impaired consciousness, no shivering	32 - 28
3	Unconscious	28 - 24
4	Apparent death	24 - 15

8. Temperature measurement

Temperature measurement is essential for diagnosis; for defining the risk of arrhythmia; and in the case of cardiac arrest establishing prognosis. The rectal route is unreliable and oesophageal probes can trigger cardiac arrest. Oral or tympanic temperature monitoring are the pre-hospital modalities of choice. TAAS carry low reading tympanic models, which read to 24 degrees centigrade for this purpose.

9. Drowning and hypothermia

History and examination of the scene is crucial in determining if resuscitation is appropriate. It is important to differentiate immersion (where airway is below water) from submersion (where airway remains above water). The patient who has become hypothermic before their airway is underwater is likely to have a better neurological outcome. Water temperatures in the UK are unlikely to cool an adult quickly enough for full neuro-protection. Children may be different due to their smaller body mass to surface area and juvenile brains may be more capable of recovery.

10. Principles of managing patient movement

Patients must be treated with minimal movements. The smallest movement can precipitate VF. Never raise the legs as the sudden return of cold blood to the core may also precipitate cardiac arrest.

11. Pre-hospital warming

If mild, hypothermia should be treated aggressively with dry clothes/blankets, a warm environment and hot drinks. However once the temperature reaches 30°C even the act of removing clothing

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could cause heart rhythm disturbance and in this case, consideration should be made to moving patient as little as possible, carefully cutting wet clothing off where possible but leaving the remainder and expediting transfer to an ECMO unit.

12. Airway management

The patient in cardiac arrest should have an ETT or LMA inserted for transfer. The decision in the severely hypothermic casualty not in cardiac arrest is more difficult as airway manipulation may precipitate cardiac arrest.

13. Cardiac arrest

A normal looking ECG rhythm compatible with a cardiac output (e.g. PEA) may suggest that the carotid pulse is too weak to feel. These patients should be treated as having a cardiac output (e.g. withhold CPR and transferred as per protocol.

Check the carotid pulse for a prolonged period > one minute in cases of suspected severe hypothermia. If available the use of ultrasound may be helpful.

Above 32°C cardiac arrest is not due to hypothermia and should be treated as per standard ALS guidelines.

Below 28°C cardiac arrest may be caused directly from hypothermia and, in the absence of evidence of cardiac arrest before cooling, every effort should be made to get the patient to extra-corporal life support with prolonged CPR if necessary.

At temperatures of less than 30°C defibrillation is very unlikely to be successful. Repeated attempts are likely to damage the myocardium and should not be attempted.

In severe hypothermia drug metabolism is slowed leading to potentially toxic plasma concentrations of any drugs given repeatedly. Withhold adrenaline and other drugs until the patient has been warmed to a temperature greater than 30°C. Once 30°C has been reached, double the intervals between doses (twice as long as normal). As the patient's temperature returns towards normal (above 35°C) use the standard ALS drug protocols.[1]

When a hypothermic patient is in asystole, an improvement in rhythm is very unlikely until the heart is rewarmed.

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14. Starting CPR

Debate continues surrounding breaks in CPR versus not starting CPR until it can be continued uninterrupted. The recent hypothermia consensus meeting concluded that there is little evidence to support the theory of not starting CPR until it can be provided continuously[3]. CPR should be started ASAP with minimal interruptions. Mechanical CPR devices are ideal if available.

It should be considered that hypothermia confers significant neuro-protection with brain metabolism falling by 6-10% every degree below 35°C. Complex heart operations of up to an hour are routinely carried out with no circulation at a temperature of 22°C. Consequently delays in starting CPR are not as disastrous as imagined.

15. Triage to ECMO

Referral should be completed at the earliest possible time via the ECMO coordinators at the Glenfield Hospital in Leicester and University Hospital South Manchester in Wythenshawe. Medical advice can be sought from the senior tier on call. It is occasionally possible for a mobile ECMO unit to be moved to the patient at a convenient DGH. Cardiopulmonary bypass is an alternative to ECMO and is available at Sheffield Northern General, UHNS Stoke, UHCW Coventry and Nottingham City Hospital (no direct route of entry). The requirement for this therapy should be discussed with the Emergency Department Consultant during the pre-alert call.

There is an agreement between mountain rescue teams and receiving ECMO centres, it is possible this may have already been started by mountain rescue on incidents we are involved in.

The ECMO co-ordinators contact details are in the Ops area of Sharepoint.

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