

INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Interventional procedures consultation document

Temperature control to improve neurological outcomes after cardiac arrest

Cardiac arrest is when the heart suddenly stops pumping blood around the body. A person whose heart is restarted can have neurological problems (brain injury). This is because the brain does not get enough oxygen during the cardiac arrest.

In this procedure, after a person's heart is restarted but while they are still in a coma, their body temperature is controlled. Their body is kept to a normal temperature of between 36.5°C and 37.5°C, or it is cooled to between 32°C and 36°C for 1 to 3 days. The aim is to improve survival and reduce the risk of developing neurological problems.

NICE is looking at temperature control to improve neurological outcomes after cardiac arrest. This is a review of [NICE's interventional procedures guidance on therapeutic hypothermia following cardiac arrest](#).

NICE's interventional procedures advisory committee met to consider the evidence and the opinions of professional experts with knowledge of the procedure.

This document contains the [draft guidance for consultation](#). Your views are welcome, particularly:

- comments on the draft recommendations
- information about factual inaccuracies
- additional relevant evidence, with references if possible.

NICE is committed to promoting equality of opportunity, eliminating unlawful discrimination and fostering good relations between people with particular protected characteristics and others.

This is not NICE's final guidance on this procedure. The draft guidance may change after this consultation.

After consultation ends, the committee will:

- meet again to consider the consultation comments, review the evidence and make appropriate changes to the draft guidance

- prepare a second draft, which will go through a [resolution process](#) before the final guidance is agreed.

Please note that we reserve the right to summarise and edit comments received during consultation or not to publish them at all if, in the reasonable opinion of NICE, there are a lot of comments or if publishing the comments would be unlawful or otherwise inappropriate.

Closing date for comments: 18 April 2023

Target date for publication of guidance: August 2023

1 Draft recommendations

- 1.1 Temperature control to prevent fever (normothermia), to improve neurological outcomes after cardiac arrest, should only be used with special arrangements for clinical governance, consent, and audit or research. Find out [what special arrangements mean on the NICE interventional procedures guidance page](#).
- 1.2 Temperature control to induce therapeutic hypothermia, to improve neurological outcomes after cardiac arrest, should be used only in research. Find out [what only in research means on the NICE interventional procedures guidance page](#).
- 1.3 Clinicians wanting to use temperature control to prevent fever (normothermia), to improve neurological outcomes after cardiac arrest, should:
- Inform the clinical governance leads in their healthcare organisation.
 - Ensure that people (and their families and carers as appropriate) understand the procedure's safety and efficacy, and any uncertainties about these.
 - Take account of NICE's advice on [shared decision making](#), including [NICE's information for the public](#).
 - Audit and review clinical outcomes of everyone having the procedure. The main efficacy and safety outcomes identified in this guidance can be entered into [NICE's interventional procedure outcomes audit tool](#) (for use at local discretion).
 - Discuss the outcomes of the procedure during their annual appraisal to reflect, learn and improve.
- 1.4 Healthcare organisations using temperature control to prevent fever (normothermia), to improve neurological outcomes after cardiac arrest, should:

- Ensure systems are in place that support clinicians to collect and report data on outcomes and safety for everyone having this procedure.
- Regularly review data on outcomes and safety for this procedure.

1.5 Further research into inducing therapeutic hypothermia, to improve neurological outcomes after cardiac arrest, should be in the form of randomised controlled trials which should include patient selection, timing of intervention, degree and duration of temperature control, neurological outcomes and survival.

Why the committee made these recommendations

Temperature control to prevent fever (normothermia)

Clinical trial evidence suggests that there may be less neurological problems (brain injury) after cardiac arrest if core body temperature is kept within its normal range (normothermia). But it is unclear if this is directly related to the procedure.

There are no major safety concerns with normothermia. But, overall, there is not enough good quality evidence on its efficacy. So, it should only be used with special arrangements.

Temperature control to induce therapeutic hypothermia

Clinical trial evidence suggests that there is no benefit from cooling the body's core temperature (therapeutic hypothermia) after cardiac arrest. But, in these trials, the procedure was often delayed. So, the importance of how long after cardiac arrest cooling is done is uncertain.

The evidence on safety shows that people who have had therapeutic hypothermia need sedation and muscle relaxants to prevent and manage shivering, and are more likely to have an abnormal heart rhythm. More

research will offer more evidence on safety and long-term outcomes. So, this procedure should be used only in research.

2 The condition, current treatments and procedure

The condition

2.1 Cardiac arrest is when normal blood circulation suddenly stops because the heart fails to contract effectively. The underlying abnormal cardiac rhythms most commonly associated with cardiac arrest are ventricular fibrillation (VF), asystole, pulseless electrical activity, and pulseless ventricular tachycardia (VT). It leads to loss of consciousness, respiratory failure and, ultimately, death.

Current treatments

2.2 Treatment for cardiac arrest includes immediate cardiopulmonary resuscitation to restore the circulation and prevent subsequent brain injury. Defibrillation may be used to treat VF and pulseless VT rhythms. Standard care may also include mechanical ventilation, and drugs such as adrenaline and amiodarone. [The 2021 resuscitation guidelines](#) contain information about basic and advanced life support.

The procedure

2.3 After cardiac arrest, people in a coma who have return of spontaneous circulation (ROSC) can have their core body temperature actively controlled to prevent fever (by maintaining normothermia, a normal temperature of 36.5°C to 37.5°C) or induced to therapeutic hypothermia (cooled to a core temperature typically between 32.0°C and 36.0°C). The aim is to reduce brain injury and improve neurological outcomes. The exact mechanism by which cooling protects against brain injury is unknown. Possible

mechanisms include reductions in metabolic demand, release of excitatory neurotransmitters and inflammation after ischaemia.

- 2.4 Temperature control is done using surface techniques (for example, heat exchange cooling pads, cooling blankets and ice packs), internal techniques (for example, an endovascular cooling device) or a combination of these techniques. Core body temperature is monitored using a temperature probe (such as a bladder, rectal or nasopharyngeal temperature probe) and is controlled to a pre-set point determined by the clinician.
- 2.5 If therapeutic hypothermia is induced, controlled rewarming is usually done over several hours. In addition, people who have had cardiac arrest generally have standard critical care measures together with intravenous sedation and muscle relaxants, to prevent and manage shivering.

3 Committee considerations

The evidence

- 3.1 NICE did a rapid review of the published literature on the efficacy and safety of this procedure. This comprised a comprehensive literature search and detailed review of the evidence from 6 sources, which was discussed by the committee. The evidence included 6 systematic reviews and meta-analyses. It is presented in the [summary of key evidence section in the interventional procedures overview](#). Other relevant literature is in the appendix of the overview.
- 3.2 The professional experts and the committee considered the key efficacy outcomes to be: survival, reduced long-term neurological disability, independent living, quality of life, and reductions in length of critical care and hospital stay.

3.3 The professional experts and the committee considered the key safety outcomes to be: arrhythmias, shivering, pneumonia, sepsis and skin damage.

3.4 Patient commentary was sought but none was received.

Committee comments

3.5 Several technologies are used for temperature control after cardiac arrest.

3.6 Using large volumes of intravenous saline to induce therapeutic hypothermia can cause serious side effects.

Tom Clutton-Brock

Chair, interventional procedures advisory committee

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