

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 after cardiac arrest can have poor neurological outcomes. This is because their brain has not had enough oxygen during the cardiac arrest, which can cause brain injury.

In this procedure, after a person's heart is restarted and while they are still in a coma, their body temperature is controlled. Either their body is kept at a normal temperature of between 36.5°C and 37.5°C to prevent fever, or it is cooled to between 32°C and 36°C. Both are done for 1 to 3 days. The aim is to improve survival and neurological outcomes.

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This document contains the [draft guidance for consultation](#).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 The draft guidance may change after this consultation.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- meet again to consider the consultation comments, review the evidence and make appropriate changes to the draft guidance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: 21 September 2023

Target date for publication of guidance: January 2024

1 Draft recommendations

Temperature control to prevent fever

- 1.1 Temperature control to prevent fever, to improve neurological outcomes after cardiac arrest may be used if standard arrangements are in place for clinical governance, consent and audit. Find out [what standard arrangements mean on the NICE interventional procedures guidance page](#).
- 1.2 For auditing the outcomes of this 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).

Temperature control to induce therapeutic hypothermia

- 1.3 Temperature control to induce therapeutic hypothermia (a temperature of less than 36°C), 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](#).
- 1.4 Further research should be in the form of randomised controlled trials, and should report:
 - patient selection
 - timing of the intervention
 - degree and duration of temperature control
 - neurological outcomes
 - survival.

Why the committee made these recommendations

Clinical trial evidence suggests that, if core body temperature is controlled to prevent fever after cardiac arrest, there may be improved neurological

outcomes (less brain injury). There are no safety concerns with fever prevention. So, it can be used with standard arrangements. But more research is needed on whether the improved neurological outcomes are directly related to the procedure.

Some clinical trial evidence suggests that there is less brain injury when the body's core temperature is cooled to below 36°C (therapeutic hypothermia) after cardiac arrest. But other clinical trial evidence suggests that there is no reduction in brain injury. In some trials, the procedure was delayed. So, the importance of how long after cardiac arrest cooling is started is uncertain.

Evidence on the safety of therapeutic hypothermia suggests that it is potentially harmful. People who have this procedure are also more likely to have an abnormal heart rhythm. More research is needed on safety and long-term outcomes of therapeutic hypothermia after cardiac arrest, so it 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
- pulseless ventricular tachycardia (VT).

Cardiac arrest 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. [Resuscitation Council UK's 2021 resuscitation guidelines](#) contain guidance on basic and advanced life support.

The procedure

- 2.3 After cardiac arrest, people in a coma who have a return of spontaneous circulation (ROSC) can have their core body temperature actively controlled. This is done to:
- prevent fever (by maintaining a core temperature between 36.5°C and 37.5°C), or
 - induce therapeutic hypothermia (by cooling to a core temperature typically between 32.0°C and 36.0°C).
- 2.4 The aim is to reduce brain injury and improve neurological outcomes. The exact mechanism by which cooling may protect against brain injury is unknown. Possible mechanisms include reductions in metabolic demand, release of excitatory neurotransmitters and inflammation after ischaemia.
- 2.5 Temperature control is done using either:
- surface techniques (for example, heat exchange cooling pads, cooling blankets and ice packs), or
 - internal techniques (for example, an endovascular cooling device).

Core body temperature is monitored using a temperature probe

(such as a bladder, rectal or nasopharyngeal temperature probe) and is controlled to a preset point determined by the clinician.

- 2.6 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, and may need intravenous sedation and muscle relaxants, to prevent 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 9 sources, which was discussed by the committee. The evidence included 8 systematic reviews and meta-analyses and 1 randomised controlled trial (RCT). 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
 - reduction in long-term neurological disability
 - independent living
 - quality of life
 - reduction 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
- skin damage.

3.4 Patient commentary was sought but none was received.

Committee comments

3.5 There are several available technologies for controlling temperature after cardiac arrest.

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

3.7 The committee was informed that additional RCTs comparing temperature control for fever prevention with no intervention are unlikely to be done.

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Chair, interventional procedures advisory committee

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