Guideline 11.8 – Temperature Control after Cardiac Arrest

Summary

This guideline provides advice on temperature control during the post-arrest period.

Who does this guideline apply to?

This guideline applies to adults who require advanced life support (ALS) after cardiac arrest.

Who is the audience for this guideline?

This guideline is for health professionals and those who provide healthcare in environments where equipment and drugs are available.

Recommendations

The 2016 Australian and New Zealand Committee on Resuscitation (ANZCOR) guideline has been reviewed and updated based on evidence reviews including the 2020[1], and 2021[2] International Liaison Committee on Resuscitation (ILCOR) ALS Taskforce evidence reviews. A systematic review was commissioned by ILCOR to inform the evidence review.[3]

The Australian and New Zealand Committee on Resuscitation (ANZCOR) make the following recommendations:

1. ANZCOR suggests actively preventing fever by targeting a temperature less than or equal to 37.5°C for patients who remain comatose after return of spontaneous circulation (ROSC) from cardiac arrest.
2. Whether subpopulations of cardiac arrest patients may benefit from targeting hypothermia at 32 to 34°C remains uncertain.
3. ANZCOR suggests that comatose patients with mild hypothermia after ROSC should not be actively warmed to achieve normothermia.
4. ANZCOR recommends against the routine use of pre-hospital cooling with rapid infusion of

large volumes of cold intravenous (IV) fluid immediately after ROSC.

5. ANZCOR suggests surface or endovascular temperature control techniques when temperature control is used in comatose patients after ROSC.
6. ANZCOR suggests that cooling devices if used, include a feedback system based on continuous temperature monitoring to maintain the target temperature.
7. ANZCOR suggests that rapid infusion of ice-cold IV fluid, up to 30 ml kg-1 or ice packs are feasible, safe and simple methods for initially lowering core temperature up to 1.5 degrees. When IV fluids are used to induce hypothermia additional cooling strategies will be required to maintain hypothermia.
8. ANZCOR suggests active prevention of fever for at least 72 hours in post-cardiac arrest patients who remain comatose.
9. ANZCOR suggests that percutaneous coronary intervention during Temperature Control is feasible and safe and may be associated with improved outcome.
10. ANZCOR suggests institutions implementing complex guidelines, such as temperature control should consider using a comprehensive approach, including clinical champions; consensus-building processes; multidisciplinary involvement; written protocols; detailed process description; practical logistic support; multi

Guideline

Induced hypothermia has been successfully used during cardiac surgery to protect against global cerebral ischaemia. Its use has been described in other clinical settings since the 1950s, particularly following cardiac arrest. Several animal and human studies have previously demonstrated the potential for therapeutic hypothermia to improve survival and neurological outcome in victims of cardiac arrest.

This topic was prioritized by the ILCOR ALS Task Force because of significant new randomized control trials (RCTs) since the previous 2015 review. The term targeted temperature management (TTM) was previously used in this guideline but has become very closely linked to the two TTM studies.[4,5] To avoid confusion and accurately reflect the content of trials and interpreting future clinical trials, systematic reviews and CoSTRs the following terms for Temperature Control are proposed:

- Hypothermic Temperature Control = active temperature control with the target temperature below the normal range (35.6 to 37.5°C).
- Normothermic Temperature Control = active temperature control with the target temperature in the normal range.
- Fever Prevention Temperature Control = monitoring temperature and actively preventing and treating temperature above the normal range.
- No Temperature Control = no protocolised active temperature control strategy.

1.0 | Who should receive temperature control?

We place a high value on the potential for increased survival with good neurologic outcome as compared with the possible risks of temperature control. The mortality after cardiac arrest is high and the treatment options are limited. Although the evidence for temperature control is low certainty it is a post-ROSC intervention that has potential improved survival with good neurologic outcome.

No studies specifically addressed cardiac arrests due to non-cardiac causes, but it is reasonable to assume that these patients might also benefit from temperature control.

Recommendations

- ANZCOR suggests actively preventing fever by targeting a temperature less than or equal to 37.5°C for patients who remain comatose after ROSC from cardiac arrest [CoSTR 2021, weak recommendation, low certainty evidence].
- Whether subpopulations of cardiac arrest patients may benefit from targeting hypothermia at 32 to 34°C remains uncertain.
- ANZCOR suggests that comatose patients with mild hypothermia after ROSC should not be actively warmed to achieve normothermia [Good Practice Statement].

2.0 | How to provide temperature control?

There are multiple methods and devices available to cool patients. Clinical trials have demonstrated active cooling methods are required in many cardiac arrest patients (>40%) after ROSC to prevent or treat fever and lower body temperature. There are currently no data indicating that any specific cooling technique increases survival when compared with any other cooling technique. Shivering may necessitate sedation and intermittent or continuous neuromuscular blockade. Use of continuous neuromuscular blockade could mask seizure activity. Pharmacological measures (acetaminophen), uncovering the patient, and lowering ambient temperature may also be used to maintain a temperature of 37.5°C.

Recommendation

ANZCOR suggests surface or endovascular temperature control techniques when temperature control is used in comatose patients after ROSC [CoSTR 2021, weak recommendation, low certainty of evidence].

ANZCOR suggests that cooling device if used, include a feedback system based on continuous temperature monitoring to maintain the target temperature [Good Practice Statement].

ANZCOR suggests that rapid infusion of ice-cold IV fluid, up to 30 ml kg-1 or ice packs are feasible, safe and simple methods for initially lowering core temperature up to 1.5°C. When intravenous

fluids are used to induce hypothermia additional cooling strategies will be required to maintain hypothermia [Good Practice Statement].

3.0 | When to commence temperature control?

Pre-hospital cooling has not demonstrated benefit despite a large number of patients studied. Rapid infusion of large volumes of cold fluid immediately after ROSC and in the prehospital setting may be harmful, with increased rates of rearrest and pulmonary oedema. Any potential harm from this therapy may relate specifically to the prehospital setting, where there may be less control over the environment, fewer personnel, and reduced monitoring capabilities.

Prevention of fever by targeting a temperature less than or equal to 37.5°C for patients should commence when it is established the patient is remaining comatose after ROSC. This is usually established in the Emergency Department for patients who have ROSC after out of hospital cardiac arrest (OHCA). Patients being transferred to hospital following ROSC after OHCA and who remain comatose with mild hypothermia should not be actively warmed to achieve normothermia.

Recommendation

ANZCOR recommends against the routine use of pre-hospital cooling with rapid infusion of large volumes of cold IV fluid immediately after ROSC [CoSTR 2021, strong recommendation, moderate certainty evidence].

4.0 | Duration of Temperature Control

Published trials have treated patients with temperature control for variable time durations after hypothermia, and for up to 72 h after ROSC.

Recommendation

ANZCOR suggests active prevention of fever for at least 72 hours in post-cardiac arrest patients who remain comatose [Good Practice Statement].

5.0 | Safety of Temperature Control with Percutaneous Coronary Intervention?

Multiple studies indicate that the combinations of temperature control, mild therapeutic hypothermia and primary percutaneous intervention were feasible and safe after cardiac arrest caused by acute myocardial infarction.

Recommendation

ANZCOR suggests that percutaneous coronary intervention during TTM is feasible and safe and may be associated with improved outcome [Good Practice Statement].

ANZCOR suggests institutions implementing complex guidelines, such as temperature control should consider using a comprehensive approach, including: clinical champions; consensus-building processes; multidisciplinary involvement; written protocols; detailed process description; practical logistic support; multi-modality, multi-level education; and rapid cycle improvement methods [Good Practice Statement].

Knowledge Gaps

- There are no RCTs of no temperature control versus fever prevention.
- There are few RCTs of temperature control after extracorporeal cardiopulmonary resuscitation (eCPR).
- There are no large RCTs of temperature control after in-hospital cardiac arrest.
- Is there a therapeutic window within which hypothermic temperature control is effective in the clinical setting?

Abbreviations

Abbreviation	Meaning/Phrase
ALS	advanced life support
ANZCOR	Australian and New Zealand Committee on Resuscitation
CoSTR	Consensus on Science with Treatment Recommendations
eCPR	extracorporeal cardiopulmonary resuscitation
ILCOR	International Liaison Committee on Resuscitation
IV	intravascular
OHCA	out of hospital cardiac arrest
RCTs	randomised control studies
ROSC	return of spontaneous circulation
TTM	targeted temperature management

References

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4. Nielsen N, Wetterslev J, Cronberg T, Erlinge D, Gasche Y, Hassager C, Horn J, Hovdenes J, Kjaergaard J, Kuiper M, Pellis T, Stammet P, Wanscher M, Wise MP, Aneman A, Al-Subaie N, Boesgaard S, Bro-Jeppesen J, Brunetti I, Bugge JF, Hingston CD, Juffermans NP, Koopmans M, Kober L, Langorgen J, Lilja G, Moller JE, Rundgren M, Rylander C, Smid O, Werer C, Winkel P, Friberg H, Investigators TTMT. Targeted temperature management at 33 degrees C versus 36 degrees C after cardiac arrest. N Engl J Med. 2013;369:2197-2206.
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About this Guideline

Search date/s	ILCOR literature search details and dates are available on the CoSTR page of the ILCOR website (https://costr.ilcor.org) and the relevant CoSTR documents:
Questions/PICOs:	Are described in the CoSTR documents (https://costr.ilcor.org)
Method:	ILCOR GRADE methodology described in ILCOR publications since 2017.

Main changes:	Change Guideline Name from TTM to Temperature Control. Modification of recommendation to emphasise temperature control and preventing fever.
Primary reviewers:	Michael Parr; Margaret Nicholson, Tonia Nicholson, Emily Reynolds
Other consultation:	
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Referencing this guideline

When citing the ANZCOR Guidelines we recommend:

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https://www.anzcor.org/home/adult-advanced-life-support/guideline-11-8-targeted-temperature-management-ttm-after-cardiac-arrest