Guideline 9.3.3 - First Aid Management of Hypothermia and Cold-Related Injuries

Summary

To whom does this guideline apply?

This guideline applies to adults, children,and infants but excludes newborns in the first minutes to hours following birth.

Who is the audience for this guideline?

This guideline is for use by bystanders,first aiders,and first aid training providers.

Summary of Recommendations

The Australian and New Zealand Council on Resuscitation (ANZCOR) makes the following recommendations in managing those who have, or may have, hypothermia [all Good Practice Statements]:

1. ANZCOR recommends rescuers perform cardiopulmonary resuscitation (CPR) on people who are unresponsive and not breathing normally (Refer to ANZCOR Guideline 8). CPR should continue until ambulance or rescue personnel take over.

2. ANZCOR suggests that for those with SEVERE HYPOTHERMIA (<28°C) who are unresponsive and not breathing normally, where it is not possible to start CPR (for example, if initially moving the person to a safer location), rescuers may consider delaying the onset of CPR for up to 10 minutes.[4]

3. ANZCOR suggests that, in situations where a person has SEVERE HYPOTHERMIA, is unresponsive, and is not breathing normally, and it is not possible to perform CPR continuously (for example, during transport), the optimal action is to alternate periods of CPR for at least 5 minutes with periods without CPR that last no longer than 5 minutes. Uninterrupted CPR should be resumed as soon as feasible.[4]

4. ANZCOR suggests preventing further heat loss using barriers that use a combination of an insulation layer, such as woollen blankets, combined with a vapor barrier, such as plastic wrap.[5,6,7]

5. ANZCOR suggests the rescuer should begin active rewarming of a hypothermic person even if the person is not shivering.[8] (see below recommendation)

6. ANZCOR suggests that a person with hypothermia who is shivering will also derive benefits (comfort, reduced cardiovascular stress) from active rewarming.[8]

ANZCOR makes the following recommendations in managing people who have, or may have, cold injury (frostbite or non-freezing cold injury [all Good Practice Statements]:

1. ANZCOR suggests, if possible, remove jewellery from the affected area and elevate the affected part.

2. ANZCOR suggests rewarming the affected part immediately. Affected fingers may be placed in the opposite armpit, the armpit of a companion, or a warm hand over a frost bitten cheek or ear.Feet can be rewarmed on the warm abdomen (underclothing) of a companion.

3. ANZCOR suggests NOT to rub the affected tissue, nor use radiant heat, nor break blisters.[9]

4. ANZCOR suggests avoiding walking on affected feet.Rest with the feet elevated.[9]

5. ANZCOR suggests ensuring that refreezing does not occur. Once the colour and consistency of the skin have been restored, the person can safely resume normal activity, provided they increase their insulation and take precautions against recurrence.

1.0 | Introduction

Exposure to cold conditions can lead to generalised cooling of the body, hypothermia, or localised cold injury. For the normal function of most body systems and organs, the human body temperature is kept controlled between narrow limits (36 to 37.5°C). Hypothermia occurs when the body gets very cold and cannot warm up on its own.

Shivering is a mechanism that the body uses to prevent hypothermia. A person who is cold and shivering with a core temperature above 35°C is cold-stressed but does not have hypothermia. Those who are cold-stressed and able to move should reduce further heat loss and take active steps to rewarm.[3]

Cold injury may be either freezing cold injury (frostbite) or non-freezing cold injury (NFCI) or trench foot.

2.0 | Hypothermia

Hypothermia occurs when the body temperature is below 35°C. As the body temperature falls, systems and organs progressively fail until death occurs. Infants and elderly people are at greater risk of developing hypothermia, or at greater risk of these complications if it occurs. Hypothermia may develop acutely, for example, by falling into icy water. More commonly, hypothermia is a gradual process. An example of this is those who have prolonged exposure to cold conditions, such as cold weather or lying on a cold floor without adequate protection.

Cooling reduces the resting oxygen consumption of most human tissues and can protect the brain from injury due to low oxygen levels. There are reports of people with normal oxygen levels before they became hypothermic making a full recovery, even after extended periods of cardiac arrest. For those in cardiac arrest due to hypothermia, immediate uninterrupted CPR is the objective, but this is not always possible or may be suboptimal when evacuating a person on a stretcher, transferring into and out of a vehicle, and at altitude.Delayed and interrupted CPR may be of benefit to those with SEVERE HYPOTHERMIC cardiac arrest, where uninterrupted CPR may be impossible.[3,4]

To accomplish passive rewarming, the person´s body temperature regulation mechanisms must be intact, and they need adequate energy stores to create their own body heat through shivering.[1] Shivering during mild hypothermia can increase heat production by three to five times.[2] Drinks with a high-carbohydrate content will fuel shivering and thus heat production, which will minimize or prevent further core cooling. Warm drinks will not provide a significant thermal benefit to the body´s core.Infact, a warm drink may temporarily inhibit shivering through the competing responses of increasing comfort in contrast to its effectiveness, which results in a decreased heat balance.[8]

In general, when external heat is applied to people who are vigorously shivering (mildly hypothermic), skin warming inhibits shivering heat production by approximately the same amount of heat that is donated, such that core rewarming rates are similar between shivering only and external warming. If external heat is available, there is a benefit of increased comfort, decreased energy requirements, and reduced stress on the heart and other body systems.[8]

People with SEVERE HYPOTHERMIA who are not shivering have a greatly reduced ability to produce their own body heat.Wrapping methods can reduce further heat loss; however, active rewarming methods are required to rewarm the person´ s core temperature effectively.[1]

2.1 | Hypothermia Prevention

Hypothermia may occur due to unavoidable circumstances, but in many cases, it can be prevented.

When planning outdoor activities, ensure the below:

Have adequate equipment and protection from cold, wind, and moisture.Wear appropriate clothing, stay dry, and be aware of any potential for 'wind chill.

Maintain a regular intake of food and non-alcoholic drinks. Eat appropriate energy food such as fruit or warm sweet fluids, if available, and drink regularly.

Have a plan for the terrain and environment, ensure that everyone is adequately trained, and that there is experienced leadership.

For further information on prevention,refer to:

Survival in cold water
https://www.maritimenz.govt.nz/recreational/safety/lifejackets/surviving-in-cold-water/

New Zealand Mountain Safety Council http://mountainsafety.org.nz/

Snow Safe https://www.snowsafe.org.au/

2.2 | Hypothermia Recognition

If temperature measurement is not possible, rescuers should use the following criteria to assess the hypothermic status of the affected person:

Mild hypothermia (32 to 35°C):

- shivering
- pale, cool skin
- impaired coordination
- slurred speech
- responsive, but possibly with delayed responses.

Moderate (28 to 32°C)to severe (less than 28°C) hypothermia:

- absence of shivering
- increasing muscle stiffness
- confusion and/or a progressive decrease in responsiveness

- slow/irregular pulse
- low blood pressure.

SEVERE HYPOTHERMIA (<28°C):

In more severe cases, there may be dangerous heart rhythms and cardiac arrest. The person may have fixed and dilated pupils and appear dead, particularly if they have a weak slow pulse.

2.3 | Hypothermia Management

ANZCOR recommends [all Good Practice Statements]:

- Rescuers follow the DRSABCD algorithm, including CPR and early defibrillation for those who are unresponsive and not breathing normally (Refer to ANZCOR Guideline 8). This should continue until an ambulance or specialised rescue personnel take over.

ANZCOR suggests [all Good Practice Statements]:

- Sending for an ambulance or rescue team.
- For those with SEVERE HYPOTHERMIA who are unresponsive and not breathing normally, where it is not possible to start CPR (for example, if initially moving the person to a safer location), rescuers may consider delaying the onset of CPR for up to 10 minutes[4]
- For those with SEVERE HYPOTHERMIA who are unresponsive and not breathing normally, only where it is not possible to maintain the continuity of CPR (for example, during transport), performing periods of at least 5 minutes of CPR with periods of no more than 5 minutes without CPR. Uninterrupted CPR should be resumed as soon as feasible.[4]
- Moving the person to a warm, dry shelter as soon as possible. Keep the person lying flat and minimise their physical activity.[3]
- Removing any wet clothing and replace it with dry clothes and protect the person against wind and draughts. Whenever possible, the ambient temperature should be raised to reduce further heat loss.[3]
- Preventing further heat loss using barriers that use a combination of an insulation layer, such as woollen blankets, and a vapour barrier, such as plastic wrap.[5,6,7]
- If the person is responsive, they should be given glucose containing ("sugary") oral fluids[7,8] and food, avoiding alcohol, caffeine, and smoking tobacco or other nicotine containing products.
- If the person is not shivering, the rescuer should begin active rewarming.[8] Active rewarming may

include:

- The use of body-to-body contact by maximizing skin-to-skin contact between the back of the person who is hypothermic and the front of a person with a normal temperature.[8]
- Chemical heat packs applied inside insulation/vapour barrier material.[7] Charcoal-burning heat packs, hot water bags, and electrical heating blankets may also be used in a safe manner. External heat should be applied to the armpit and on the chest and/or back (if possible) as these are the locations that provide the most efficient heat transfer.[3] Some external rewarming methods pose a risk of burning the skin if they are applied directly. The manufacturer´s directions must be followed, especially those that suggest placing appropriate insulation between the heat source and the skin.[8]

· Active rewarming should also be applied to people with hypothermia who are shivering, due to the benefits of increased comfort, decreased energy requirements, and reduced cardiovascular stress.[8]

· Rescuers should be aware of their own risk of developing hypothermia in cold environments and should monitor their own status and that of any companions as well as that of the affected person.

3.0 | Cold Injury

Freezing Cold Injury (Frostbite)

Frostbite occurs when tissues freeze. This happens in cold environments when blood vessels constrict and reduce blood flow and oxygen to the tissues. Frostbite usually affects body parts that are farther away from the body's core, and therefore normally have less blood flow. These include the feet, toes, hands, fingers, nose, and ears. However, it can affect any part of the body. When there is less blood flow and less internal heat delivered to body tissue, this may result in ice crystals forming in cells, which causes cell death. Damage to the affected tissue is worse when there is prolonged cold weather exposure and the tissue slowly freezes.

Frostbite injury is classified as either superficial or deep, depending upon the depth of injury. Deep frostbite extends beyond the superficial skin tissues and involves tendons, muscles, nerves, and bone.

Non-Freezing Cold Injury

Some conditions do not involve freezing of the skin, such as chilblains and frostnip. Prolonged exposure of limbs to low temperatures above zero degrees may lead to "trench foot" or "immersion

foot". The injured part may be pale, pulseless, immobile, and lack feeling, but it is not frozen. Although there is no formation of ice crystals in the tissue, the cold temperature alone may cause damage to nerves and to the lining of small blood vessels, leading to poor or no blood flow.

3.1 | Cold Injuries Management

ANZCOR suggests [all Good Practice Statements]:

· Applying general management principles regarding shelter, ambient temperature, and sending for help, as outlined in the management of hypothermia above.

· If possible, remove jewelry from the affected area and elevate the affected part.

· Rewarming the affected part immediately. Affected fingers may be placed in the opposite armpit, the armpit of a companion, or a warm hand over a frostbitten cheek or ear. Feet can be reheated on the warm abdomen (under clothing) of a companion.

· DO NOT rub the affected tissue, use radiant heat, or break blisters.[9]

· Avoid walking on affected feet. Rest with the feet elevated.[9]

· Ensuring that re-freezing does not occur. Once the color and consistency of the skin have been restored, the person can safely resume normal activity, provided they increase their insulation and take precautions against recurrence.

For those specifically trained in rescue in cold environments (alpine, polar, tundra), ANZCOR suggests [all Good Practice Statements]:

· Rewarming of deeply frozen body parts only if there is no risk of refreezing.[10,11,12] For severe frostbite, rewarming should be accomplished within 24 hours.

· If tissue is frozen, the best tissue outcomes can be achieved from placing the injured part in warm water with circulating water at 37 to 39°C until the affected part thaws. The water needs to be circulating to avoid cooling the water adjacent to the part being thawed and then insulating the part from the rest of the warm water. This may take 30 minutes or more and is best achieved under hospital conditions where infection control and adequate pain relief can be provided.

· Chemical warmers should not be placed directly on frostbitten tissue as they can reach temperatures that can cause burns. Following rewarming, efforts should be made to protect frostbitten parts from refreezing and to quickly evacuate the person for further care.[10]

· If tissue has spontaneously thawed (as is often the case), the water bath is not required, but

affected tissue can be cleaned and bathed at a more comfortable temperature (30 to 35°C).

4.0 | References

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About this Guideline

Search date/s:	December 2024
Question /PICOs:	Population: Adults, children and infants out of hospital with hypothermia or cold injury Intervention: Any method of treatment available to lay person (not HCP). Comparators: Any other method or none. Outcomes: Improve survival to hospital discharge, length of stay, reduced complications or disabilities from cold injuries . Study Designs: Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) are eligible for inclusion. It is anticipated that there will be insufficient studies from which to draw a conclusion, hence case series may be included in the initial search. The minimum number of cases will be set by the lead author after discussion with the subcommittee. Grey literature and social media and non-peer reviewed studies, unpublished studies, conference abstracts and trial protocols are eligible for inclusion as well. All relevant publications in any language will be included as long as there is an English abstract. Timeframe: All years
Method:	Scoping search, see worksheet https://nzrc.sharepoint.com/:w:/g/EZSV83hAgdRBpRO-JML6M-0BIMySWgKBuwoKQMFZoXpGvQ?e=cPESPk
Main Changes:	The problem with rapid rewarming of non-freezing cold injuries has been included. The problem with rapid rewarming of non-freezing cold injuries has been included.
Primary reviewers:	Finlay Macneil, Solange Costermans, Jonathon Webber, Kevin Nation
Other consultation:	N/A
Worksheet:	N/A
Approved:	September 2025
Guideline superseded	9.3.3 Aug 2021

Abbreviations

Abbreviation	Meaning/Phrase
ANZCOR	AustralianandNewZealandCommitteeon Resuscitation
CoSTR	International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations
CPR	Cardiopulmonaryresuscitation
NFCI	Non-freezing cold injury

Referencing this guideline

When citing the ANZCOR Guidelines we recommend:

ANZCOR, 2026, Guideline 9.3.3 - First Aid Management of Hypothermia and Cold-Related Injuries, accessed 29 September 2026, https://www.anzcor.org/home/first-aid/guideline-9-3-3-first-aid-management-of-hypothermia-and-cold-related-injuries